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AMERICAN ANTIQUITY

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CULTURE SEQUENCES IN CENTRAL CALIFORNIA ARCHAEOLOGY

RICHARD K. BEARDSLEY*

AN analysis of the archaeology of two coastal areas of Central California gives strong support to the sequence of three culture periods proposed in 1939 for the prehistoric archaeology of the lower and middle Sacramento River Valley.[1] For one area, the ocean coast of Marin County just north of San Francisco Bay, the first intensive excavations were made by archaeological field parties from the University of California during the summers of 1940 and 1941;[2] the data and conclusions have not been published previously. For the second area, around the shores of San Francisco Bay, few additions have been made to the artifact collections and field data since the latest full site report was made in 1926.[3] However, the interpretation presented here comes from reappraisal of the original artifacts and notes from the limited number of published sites, and from study of museum collections from a greater number of smaller sites which have not yet been described in print. The culture sequences revealed in the study of these two coastal areas agree closely with those outlined for the nearby Sacramento Valley, and present the coast of Central California in a new light. Further, these offer additional perspective on the archaeology of the interior region.

For many years, the fundamental theme of California archaeology was its lack of recognizable change. The most frequently cited examples of this cultural stagnation were the shell mounds around San Francisco Bay. These were first examined almost half a century ago for evidence of evolution in culture.[4] Since artifacts of excellent workmanship frequently appeared in the lowest levels, it was properly insisted that no site showed convincing evidence of local cultural evolution.[5] But the opinion that *evolutionary* change was unproven changed imperceptibly into the reiterated thesis that *all* cultural change was lacking. Not until new fields were entered was this dogma shaken. David Banks Rogers' volume on the archaeology of the Santa Barbara region, published in 1929, and Ronald L. Olson's preliminary report, which appeared the next year, concurred in the view that successive cultures occupied the mainland and offshore islands.[6] The suggestion of culture change was echoed in the Stockton-Lodi area by W. Egbert Schenck and E. J. Dawson in their report on the northern San Joaquin Valley.[7] It remained for summary reports of the intensive work done in close collaboration by the University of California and the Sacramento Junior College in the lower Sacramento Valley to substantiate, with detailed tabulations, the view that Central California prehistory had not been endlessly static and unchanging after all, but instead had several distinctly recognizable stages of development.[8] Finally, culture

* The painstaking advice and generous encouragement of Dr. R. F. Heizer, Franklin Fenenga, and Dr. J. B. Griffin are gratefully acknowledged.

[1] Lillard, Heizer, and Fenenga, 1939; Heizer and Fenenga, 1939. Shell bead and ornament types of the present paper are taken from the former of these papers.

[2] Sponsored by the Department of Anthropology and supported by grants from the Board of Research, University of California. A report on the historically significant finds of porcelain and iron spikes is in print (Heizer, 1941*b*).

[3] Reports on the principal excavations of the San Francisco Bay area are: Nelson, 1910; Schenck, 1926; and Uhle, 1907. Other publications relevant to the area include Gifford, 1916; Kroeber, 1911, 1925, pp. 927–33; Loud, 1924; Nelson, 1909.

[4] Uhle, 1907. See especially pp. 36–41.

[5] E.g., Kroeber, 1925, p. 930.

[6] D. B. Rogers, 1929; Olson, 1930.

[7] Schenck and Dawson, 1929.

[8] Lillard and Purves, 1936; Lillard, Heizer, and Fenenga, 1939; Heizer and Fenenga, 1939. See also Kroeber, 1936*a* and 1937, in which the broader patterns of California archaeology are examined in new perspective.

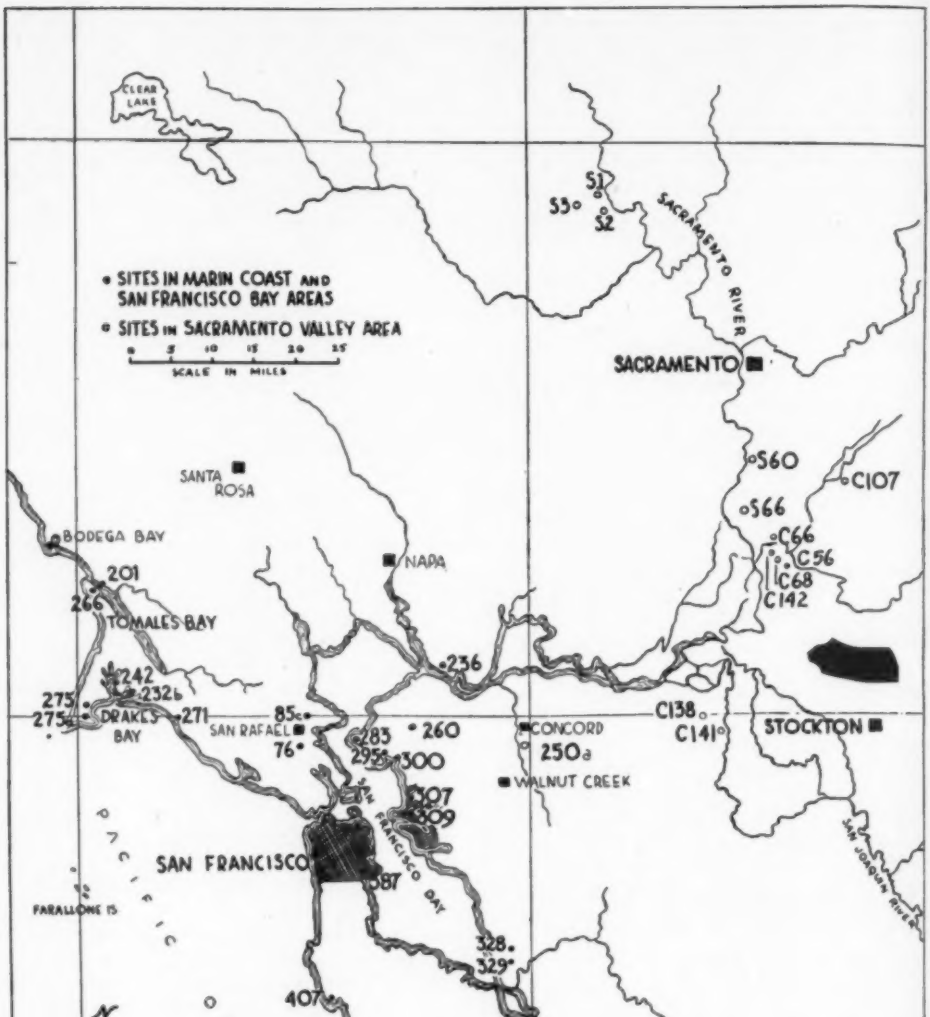

FIG. 1. Archaeological sites in Central California.

changes defined by Waldo Wedel in his report on the extensive excavations conducted by the Smithsonian Institution under Civil Works Administration in the southern San Joaquin Valley[9] gave greater body to the new outlook on California archaeology and left the coastal

[9] Wedel, 1941; see also Stirling, 1935.

regions of Central and extreme Northern California as the only excavated areas in which cultural succession has been consistently denied.[10]

For the present paper, consideration has been somewhat arbitrarily limited to the three excavated areas within about a one hundred mile radius of San Francisco Bay, collectively referred to as Central California (Fig. 1). The problem apparent at the outset was whether it was true that clearly marked culture changes might occur in the inland zone of this region without recognizably affecting the coastal population.[11] In the years that had passed since excavation of the San Francisco Bay mounds, techniques had progressed beyond the application of an unrefined stratigraphic principle, just as anthropological theory had outgrown the stage at which evolutionary development of culture in the classical sense was a primary concern. In the first place, as hints of culture sequence appeared, those who were digging in the Sacramento Valley sought small sites in order to isolate pure manifestations of each culture, as well as continuing to probe the problems of stratigraphy in large and complex sites. Of equal importance was the development of a sharper analytic technique which exploited the potentialities offered by the abundant burials of Central California middens. Each burial, with its associated artifacts and traits, was treated as a unit in stratigraphic analysis, in contrast to the former procedure of plotting the depth of each individual artifact without regard to its associations. Another methodological advance was the recognition of a class of burial artifacts in pottery-less California which is able to serve the important function filled by ceramic analysis in other areas. Shell bead and ornament types supply such a class, combining frequent occurrence and comparability of form with relatively sensitive variation. These techniques of burial analysis were first applied to interior sites of the Sacramento Valley, and the reports, which are frankly presentations of burial complexes rather than of prehistoric *cultures* in the full sense, carry their evidence in terms of itemized burial tabulations. The same procedure has now proven successful as a method of working out the culture sequences of the coastal areas.

The principal periods, or culture horizons, thus outlined in the lower Sacramento Valley area were named Early, Transitional, and Late.[12] The same scheme is used as the basic frame of the cultural sequences presented in this paper, but with the following changes and additions. The Transitional Horizon (or Period) is now called Middle Horizon, to avoid unwarranted implications. Each *horizon* of the sequence is split into *provinces*, which are areas of cultural similarity that also show a certain geographic consistency. Because the provincial configurations differ in various time levels, separate province names have been used for each horizon. The cultural units in each province are called *facies*, and are groups of intimately related settlements or *components* (Table 1).

The concept of a component, as the archaeological record of human occupancy of a single locality at a specific time, is borrowed without change from the Midwestern Taxonomic System; the components described in this paper are essentially full settlements or communities which have evidence of the various living activities together with the remains of the dead at the same spot. The term "facies" similarly corresponds to the "focus" of the Midwestern Taxonomic System and has been used instead to avoid the erroneous implication that the whole Midwestern system is duplicated here. Thus, the original sequence of culture horizons has been further divided into provinces, facies, and components to embrace the archaeology of the littoral zone as well as the interior zone of Central California.[13]

Since, as noted above, burial information is of paramount importance to the problem of determining cultural relations in Central Cali-

[10] See Fn. 3; Loud, 1918. Relationship of certain sites with the Sacramento Valley Transitional (Middle) Horizon was suggested, however, by Heizer and Fenenga (1939, p. 396).

[11] An investigation of this specific problem begun by Alex D. Krieger in 1937 had already suggested time differences among coastal sites. I am obliged to Mr. Krieger for access to his notes from this inquiry.

[12] In the Late Horizon further temporal subdivisions were recognizable and numbered as Phases 1 to 3. For discussion see Heizer, 1941*a*.

[13] See Table 1. This table represents agreements reached by R. F. Heizer, F. Fenenga, and the present author, who are jointly responsible for the terminology used, and has benefited from the advice of Professors T. D. McCown and A. L. Kroeber. Note that components are given the site name, plus alphabetic lettering A, B, C, and so on from the surface downward, in the case of multi-component (i.e., stratified) sites.

TABLE 1. CULTURE SEQUENCES IN CENTRAL CALIFORNIA ARCHAEOLOGY

(Lower case names are components. Classificational terms are capitalized.)

		LITTORAL ZONE		INTERIOR VALLEY ZONE	
		MARIN PROVINCE	ALAMEDA PROVINCE	COSUMNES PROVINCE	COLUSA PROVINCE
LATE HORIZON	PHASE 2	ESTERO FACIES: Estero A, McClure A, Cauley A, Toms Pt.	FERNANDEZ FACIES: Fernandez A, Newark #1 A	MOSHER FACIES: Mosher, Johnson, Goethe, Nicolaus #4, Nicolaus #5, Hotchkiss A, Hicks A	MILLER FACIES: Miller A, Howells Point A
	PHASE 1	MENDOZA FACIES: Mendoza, Cauley A	EMERYVILLE FACIES: Emeryville A, Greenbrae B, Bayshore A, Ponce A, Maltby, Glen Cove	HOLLISTER FACIES: Hollister, Brazil A, Hotchkiss B, Hicks B	SANDHILL FACIES: Sandhill, Miller B
		COASTAL PROVINCE		INTERIOR PROVINCE	
MIDDLE HORIZON		McLURE FACIES: McClure B, Estero B, Cauley B	ELLIS LANDING FACIES: Emeryville B, Greenbrae B, Bayshore B, Ponce B, Ellis Landing, Stege, Potrero, W. Berkeley, San Rafael B, Newark #1 B, Fernandez B?, Monument ?, Princeton	MORSE FACIES: Morse, Van Loben-Sels, McGillivray A, Calquhoun, Koontz, Hicks C DETERDING FACIES: Deterding, Wamser BRAZIL FACIES: Brazil B NEED FACIES: Need, Vail ORWOOD FACIES: Orwood #2	
EARLY HORIZON		(Unknown)		(Province Unnamed) WINDMILLER FACIES: Windmiller C, Blossom, McGillivray B, Phelps	

fornia, it is methodologically sound to treat mortuary data as a rough index of the quality of the sample from each area. The numbers of burials and cremation having sufficiently accurate data to be used in this analysis are shown in Table 2.

Table 2 clearly shows that the Sacramento Valley area enjoys fullest documentation. It may be added that the burials here are distributed more evenly among the sites than on the coast, where some sites produced fewer than ten burials despite quite extensive excavations. As a general rule, moreover, a higher percentage of burials with artifacts is encountered in the

TABLE 2. CENTRAL CALIFORNIA MORTUARY DATA USED IN MAKING PRESENT CULTURAL ANALYSIS

	Sacramento Valley* (13 sites)		San Francisco Bay** (13 sites)		Marin County (7 sites)	
	Bur.	*Cremat.*	*Bur.*	*Cremat.*	*Bur.*	*Cremat.*
Late Horizon	249	30	76	20	64	34
Middle Horizon	261	18	150	..	35	..
Early Horizon	197	..	(2)	..	..	..
Totals	707	48	228	20	99	34

* Total in this column is from Lillard, Heizer, and Fenenga, 1939. For various reasons many of their reported burials are not included.

** This column shows a selection from a potential total of more than 1060 burials in the 13 sites considered. At Emeryville and Ellis Landing sites, 705 and 106 burials, respectively, were counted during excavations or while the mounds were being leveled by steam shovel. Only a portion of these have any fuller record than the simple notation of their presence. The selection shown here was limited to burials having a definite record of accompanying artifacts, or having clear notation of their location relative to such burials.

interior than along the coast. Nonetheless, the sample from all three areas is large enough to make fairly reliable the definition of culture complexes presented here.

Of all these classificational divisions the most clear-cut is the cleavage between horizons. In other words, within this hundred-mile area temporal differences are sharper than changes from one area to another. There are, however, trait uniformities running from one end of the archaeological record to the other, though with variable emphases, as a glance at Figure 2 will show. Firmly settled village residence and lack of agriculture are two obvious examples; also the use of charmstones, beads, and ornaments made from ocean shells; primary burial of the dead; and other traits. The evolutionary point of view may find comfort in an apparent development through increasing complexity of the seed-grinding complex and, more certainly, in the use of baked clay objects in the Sacramento Valley.[14] Many Early Horizon traits gradually become extinct in the Middle Horizon, while new traits are introduced which finally flower in the Late Horizon. Yet the cultural configurations of each horizon are essentially distinctive. The earlier term used for the Mid-

[14] Cf. Heizer (1937) for an extensive review of the use of baked clay in the Sacramento-San Joaquin Valleys. Note, however, that he has modified his views on the origin of this complex because of later discoveries in the Early Horizon which may indicate local invention (Lillard, Heizer, and Fenenga, 1939, p. 75).

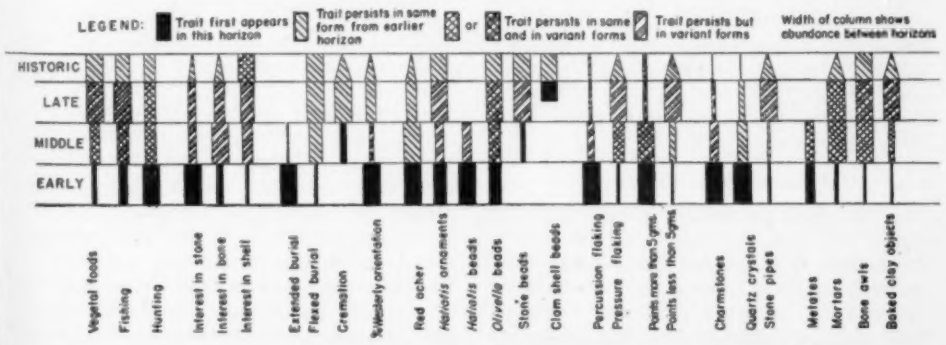

FIG. 2. Culture development in Central California (compiled jointly by R. F. Heizer, F. Fenenga, and R. K. Beardsley). Note: The Sacramento Valley area is most accurately represented in the selection of traits shown; coastal areas are weakly represented or have somewhat different development of certain traits, and lack evidence for Early Horizon traits.

dle Horizon, viz., "Transitional Horizon," recognized the overlapping traits but underrated or at least did not sharply delineate the distinctive configurations.

Traits unique to each period will be mentioned below. At this point, however, an attempt may be made to characterize the distinctive flavor of each. In concrete terms, one can point to the predominating interest of the Early Horizon in stone materials, of the Middle Horizon in bone, and of the Late Horizon in shell. Working with the collections, however, one acquires a stronger sense of differences which can be described only impressionistically at this point. The Early Horizon burials are disposed in such rigorously predictable fashion and accompanied by such a surprising amount and variety of carefully made and ritually treated artifacts as to imply keen and personal concern with the ceremonialism of death. Unfortunately, we know relatively little of the other aspects of life. There is no doubt, however, that the people of the Middle Horizon took comparatively little account of the death of any but a few select individuals. Most burials have few or none of the array of grave goods which accompany a small honored number of their dead. Strife is emphasized by the number of Middle Horizon burials found with projectiles embedded in the bone or with other marks of violence. For the Late Horizon, we seem to discern still different orientations; domestic arts find more favor than before. The people of the Late Horizon lavish artistic care on mortars, pestles, and similar household implements, or improve their own beauty with personal ornaments of bone, feather, or shell. Impressive reserves of shell beads and ornaments, which served also as wealth in historic times, were buried with the dead or destroyed together with their ornate basketry in cremation fires. Thus, each horizon has its distinctive flavor and varying foci of interests as reflected particularly in burial customs.

THE NATURAL SETTING

In this paper the Interior Zone includes the middle and lower drainage of the Sacramento River. This river and the San Joaquin River run from opposite ends of the Great Central Valley of California and meet near San Francisco Bay in a confusion of deltaic tidal channels (Fig. 1). The extremely flat, low-lying valleys of each merge at this point without perceptible topographic break. A network of meanders and sloughs made a reed marsh wilderness of the lower river reaches east of San Francisco Bay and left very little permanently dry ground, until recent drainage and flood control turned it into rich farmland. Farther up the Sacramento on either side lie great overflow basins which are still subject to periodic inundations. Although grassland and oak groves sheltered abundant animal life and provided lush plant harvests, Indian habitation was concentrated along the river banks, where natural levees or rare elevations provided flood-free locations for the villages of successive generations of Indians. The limited number of unflooded spots thus partly accounts for an abundance of stratified village remains.

The Interior and Littoral Zones are separated by the much-dissected, steep-sided hills of the Coast Ranges, which, though habitable, form a real barrier except where the San Joaquin and Sacramento Rivers join and flow westward through Carquinez Straits into San Francisco Bay. The topography of the Littoral Zone shows an abundance of rocky cliffs along the ocean front, broken by rare inlets where the ocean has invaded the mouths of a few short streams. A lone arm of land projects from the uniform coastline at Marin County and hooks southward to provide sheltered water in Drake's Bay. This arm is all but cut off from the mainland by a gash from the northwest known as Tomales Bay. Archaeological excavation of the Marin County coast has been confined to the triangle of land thus bounded by Tomales Bay, Drake's Bay, and the ocean, where sheltered waters and less rugged cliffs invited the Indians to seashore habitation (Fig. 1).

The landlocked salt waters of San Francisco Bay intensified the attractions which brought settlement to the Marin County coast. Stretches of broad beach and shallow water alternating with rocky peninsulas reaching into the bay permitted various types of fishing, waterfowl hunting, and shellfish collecting, while hills that surrounded the bay furnished grasses and oak groves for plant food. The quiet waters of the bay were easily crossed on the double-ended reed balsas used by the Costanoan Indians of historic times. It might be thought that communication with the Indians of the Sacramento and San Joaquin rivers by means of these same balsas via the Carquinez Straits gap in the Coast Ranges would be easier than liaison across the rough

encircling hills with Indians of the coast. But the archaeological remains suggest strongly that a common littoral economy gave more binding ties along the coast than between the bay and the interior, although the physiographic boundaries were not sharp enough to isolate any of the three areas from the others.

Climatic conditions reinforce this division with surprising sharpness. Though the famed climate of California is shared by both the Littoral and Interior Zones, which have warm dry summers and cool rainy winters, with temperatures consistently above freezing, the Sacramento Valley has less moisture and much more extreme fluctuations of temperature. On the coast only 7 degrees difference exists between the hottest and coldest average monthly temperatures. This results principally from the prevailing summer fogs, which keep the coastal summer temperatures from 30 to 40 degrees below averages for the interior valley. The unbroken barrier of hills, by blocking sea winds, preserves these inequalities in climate.

THE EARLY HORIZON: WINDMILLER FACIES

Four sites in the Mokelumne River region of the lower Sacramento Valley, yielding almost 200 burials, give us our knowledge of the Early Horizon. A complete report on the Early Horizon by Robert F. Heizer is in preparation. Since in the present paper our interest is focused on the cultural manifestations shared by coast and interior, and the Early Horizon is not yet certainly located in the Littoral Zone, only a very brief summary of this extremely interesting period need be given to indicate the possible coastal relations.[15]

The physiographic situation and site conditions alone suggest very considerable antiquity. The sites are on subsurface clay knolls which barely protrude through silts accumulated on the flat valley floor; the deposit mass is extremely indurated; stones and bones alike are incrusted with mineral deposit; and chemical alteration of the bone has occurred. Absolute age of this period is entirely conjectural, but Heizer's considered estimate is between 4,000 and 5,000 years.[16] Relative position in the sequence is securely fixed at the type site, the Windmiller site, where the Early Horizon component is the basal member of an Early, Middle, Late stratigraphic sequence. This and the McGillivray component may be burial knolls more than true settlements, since little occupational refuse was found in excavation.[17]

Most knowledge of the Windmiller Facies comes from burials, 70 per cent of which are associated with artifacts. Excellently preserved skeletons show a large-boned, rugged population with long, high heads and broad noses. Most striking among cultural traits is the burial position and orientation. Over 90 per cent are buried face down in extended position, arms at the sides and legs together as though tied, the head oriented strictly to the west. Associated artifacts are outstanding for their variety as much as for their careful workmanship. Most commonly represented classes are *Olivella* and *Haliotis* shell beads, large flaked projectile points, and clear quartz crystals. Although utilitarian items are scarce in burial association or deposit, the materials in hand suggest that hunting received more emphasis than fishing or the gathering of roots and seeds. Small, light projectile points are rare or absent; the commonest large forms have slanting shoulders and straight or contracting stems. Curved bone hooks, straight "gorge" hooks, and fish-spears with trident points were used in fishing; weighted nets may have been used, if a few miniature, biconoid, baked clay objects, among other artifacts, are correctly interpreted as net sinkers.

The scarce bone tools include no slim-pointed awls characteristically associated with the manufacture of coiled basketry. Coiled basketry is presumed absent for lack of evidence, but twined basketry impressions are found on several of the limited number of hand-molded baked clay objects. One or a few specimens each is known of bone splinter awls, cylindrical eyed needles, flat-shafted thatching needles, blunt-ended split bone implements,

[15] Some distinctive artifact types are illustrated on Plate 1, *left column*. Published accounts of the Early Horizon are available in Lillard, Heizer, and Fenenga, 1939; Heizer and Fenenga, 1939. I am grateful to Dr. Heizer for information from his unpublished monograph which I have used here. The four components are: Windmiller (C107), McGillivray (C142), Phelps (C56), and Blossom (C68).

[16] Cook and Heizer, 1947, p. 218, wherein a new and promising approach to dating by chemical analysis of altered bone is described..

[17] Light may be thrown on this problem by the results of renewed excavation at Blossom site sponsored by the University of California Department of Anthropology in the summer field season of 1947.

and bird bone tubes. Characteristic Middle Horizon implement types are foreshadowed in long, spatulate forms with rounded or concave ends, certain ones of which are described as sweat scrapers.

Ceremonial implements are numerous and varied. Human bone is utilized to make a skull "cup," a fibula dagger, and a radius whistle. Charmstones, the polished plummet-like stone objects of uncertain use famous in California archaeology, are commonly found with Early Horizon burials, in several unusual or unique forms. They are made from ornamental materials such as alabaster, mottled granite, and blue schist, in flattened or cylindrical forms tapering to either end from a central bulge. On occasion shell beads are affixed with asphaltum to one flattened face. Early Horizon charmstones almost invariably have a biconically drilled suspension hole near one end. Almost one-quarter of the burials have whole or fragmentary quartz crystals, sometimes in large numbers. A few short tubular stone pipes are known, but none shows evidence of having been smoked.

The shell beads which help to define the Early Horizon include a large, rectangular *Olivella* bead with ground surfaces (Type 2a); a small, rectangular *Haliotis* bead perforated once (Type 1a) or twice (Type 2); and a small, whole *Olivella* bead (Type 1c). Beads occur at the neck or are scattered as though used as sequins, and are also asphalted on various objects such as charmstones or shell ornaments. Distinctive *Haliotis* ornament types include a disc with one or two central perforations (sometimes used as facings on wooden earplugs, the holes plugged with asphaltum) and a concave-sided rectangular form. The only decoration of shell ornaments is made by radially incised lines near the edges.

Powdered red ocher, found with about 10 per cent of the burials, may have been ground on palettes. The one example known is of ocher-coated sandstone and is strongly reminiscent of Hohokam palettes of slate with rectangular outline and rectangular central basin.[18] Special ornamental features of the Middle Horizon are foreshadowed by ornaments of biotite mica, perforated ground slate pendants, and slender obsidian cores which may have been tinklers or bangles,[19] as well as by the ocher scattered in the burial fill.

[18] Gladwin and others, 1937, p. 121 ff. (Cf. Type C.)

No components comparable to the Windmiller Facies have yet been identified in sites of the Littoral Zone, yet specific trait resemblances to the Windmiller Facies have sporadically appeared. These include prone, extended burials at or near the base of the Ponce B (N356), Neward #1 B (N328), and Ellis Landing (N295) sites; Type 1 *Haliotis* beads in the Emeryville (N309) and West Berkeley (N307) sites; and *Haliotis* disc ornaments with twin central perforations at the West Berkeley site. When we turn to the Interior Valley Zone, we find there centrally perforated shell ornaments whose central perforations apparently were considered useless and were plugged with asphaltum. The postulation that these ornaments were traded ready-made from the coast presupposes a shell-working population in or near the Littoral Zone contemporaneous with and trading to the Windmiller facies.[20] The coast combines land and sea food resources which might well have attracted settlement by an ancient hunting-gathering culture. But components as ancient as Early Horizon might be rare or unusually difficult to find because of subsequent shore erosion and subsidence or burial beneath deep deposits of later periods. It is just such rare remains, however, which have the best chance of surviving the destruction of sites that has accompanied industrialization of the San Francisco Bay area. Even Middle Horizon coastal deposits have been found to extend below present ground and water level;[21] antecedent Early Horizon components underlying these may still lie undisturbed for ultimate discovery and excavation.

MIDDLE HORIZON: INTERIOR AND COASTAL PROVINCES

There is no doubt that Central California was well populated during the Middle Horizon. Sites are plentiful in the interior and, on the coast, are at least as numerous as Late Horizon

[19] These prismatic cores are limited to the Coastal Province in Middle Horizon; their recurrence in interior components of Late Horizon is part of an interesting problem. See p. 14 below.

[20] This inference was first developed in Lillard, Heizer, and Fenenga, 1939, p. 75.

[21] Nelson, 1909, p. 374 and Pl. 49, for the Ellis Landing site (N295), and Nelson, unpublished notes, for the Bayshore site (N387) in San Francisco Bay; the author's unpublished notes for the McClure site (P-B266) on Tomales Bay in Marin County.

components. Broad cultural similarities link all components of the horizon, but the Coastal Province is clearly distinguishable from the Interior Province by various trait differences, not least of which is reliance on different food sources. Components on the ocean coast and bay shores are generally shell mounds, whereas those of the interior have only random fragments of river mussel shell scattered through the deposit of camp refuse.

Interior Province components are divided into five facies in recognition of the differences among more than twenty components excavated in the low lying river delta and in higher ground along stream courses to the north and east. These are the Morse, Deterding, Brazil, Need, and Orwood B Facies, of which the Morse Facies is best represented.[22] The two facies of the Coastal Province are Ellis Landing, with twelve components around the shores of San Francisco Bay and on the ocean coast south of the Golden Gate, and McClure, with three sites on Drake's Bay and Tomales Bay north of the San Francisco Bay entrance. (See Table 1.)

The refuse accumulations of Interior Province components are tough and indurated, though by no means compacted and solidified by calcareous cementation to the extreme degree of Early Horizon components. These settlements differ from Early components also in the fact that each site was intensively occupied, as shown by the abundance of fire cracked stones, fish, bird, and animal bones, and the ash and charcoal which contribute a perceptibly "greasy" texture to the soil of the deposits. Depth of deposit varies from 48 to over 100 inches. Occasional stream alluviation, however, contributed non-occupational deposition to the deepest of these sites (S99, Deterding Component). Although, in the Coastal Province, field observations of Ellis Landing Facies deposits are not consistent, more compact deposit and more complete maceration of shell than in Late components is noted for the type site at least. McClure Facies components also have compact deposit, in which shell is relatively sparse and finely ground. Ample evidence of regular habitation, nonetheless, is present in the form of burned stones, bones, ash, and the like. Depth of deposit in Coastal Province components has the surprising range of 2 to 24 feet. Much of this variation undoubtedly is due to more permanent habitation, greater percentage of thick-shelled molluscs in the diet of certain localities, or similar factors having no invariable relation to length of occupation. It is quite patent that depth of accumulated deposit alone cannot serve as a simple yardstick to measure the relative age of any of the Central California archaeological sites, because of the importance of factors unrelated to time lapse.

Limited measurements of crania from Middle Horizon components in the Interior Province show relationship to the physical type of the Early Horizon.[23] A departure from the long and high-headed, broad nosed standard of the Early Horizon in the direction of the Late Horizon is indicated, however. It remains for future skeletal analysis to demonstrate how accurate is this apparent distinction, and whether it was gradual mixture or actual population replacement that produced the changes suggested slightly in Middle Horizon, more strongly in Late Horizon. Crania identifiable with the Ellis Landing Facies of the Coastal Province are consistently mesocephalic, and may represent a different genetic group from that of the Interior Province, where the range of metrical variation is greater. Crania of the McClure Facies are not completely studied so that no statement on these is possible at present.

Burial customs of the Interior Province are much different from those of Early Horizon. Extremely tight flexure of primary burials is most characteristic, although semi-flexure and extension, both prone as in Early Horizon and supine, are present. Loose flexure, resembling a relaxed sleeping posture, is more common in all components of the Coastal Province. In both provinces disposition may be on either side, back, or front; orientation is almost as variable, but a modal tendency is exhibited toward orientation in the western or southern quarters of the compass or, on the coast, toward the nearest body of water. Group burials and contorted burials are known especially from the Coastal Province. The Interior Province of the Middle Horizon is distinguished by the introduction of cremation. Although cremation became more popular and spread throughout the Central California area in Late Horizon times, it remained a relatively minor practice re-

[22] A full report on Interior Province components is in preparation by Franklin Fenenga. See Plate I for some distinctive artifact types.

[23] Lillard, Heizer, and Fenenga, 1939, p. 73.

TABLE 3. SELECTED MIDDLE HORIZON TRAITS, SAN FRANCISCO BAY AREA SITES*

(Summary shows sites[no. of burials/no. in deposit]. Site columns show occurrences of burials [B] and deposits [D]. +=present, number not known. ( )=trait or attribution within site uncertain. The number of objects is not shown. The columns at the left refer to the Middle Horizon; at the right, to the Late Horizon.)

	Emeryville 14'-32'		Ellis Ldg. 4'-28'		W. Berkeley 0'-13'		Potrero 0'-9'		Fernandez 3'/6'-?		Bayshore 5'-10'		Ponce 4'-9'		Princeton ?		Greenbrae 3'/6'-17'		Steege ?		San Rafael 3'/8'-10'		Newark 3'/4'-7'		Summary Middle Horizon	Summary Late Horizon	Glen Cove ?		Emeryville 0'-10'/14'		Ellis Ldg. 0'-4'/6'		Bayshore 0'-3'		Ponce 0'-3'		Greenbrae 0'-3'/6'		San Rafael 0'-3'/5'		Fernandez 0'-3'/6'		Newark 0'-3'/4'	
	B	D	B	D	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D
Total burials	32	38				21		21		2		8		8		(12)		1		5		(6)		11						4		16		(2)		14		15		6		(5)		9	
Total cremations	?	?	1	3	33			38		?		37		?		?		?		30		50	36							8		?		?		21		?		66		0		55	
Per cent with grave goods	1			+			+										1		3											100													
Mortar type B1		1		2			1																																	1	1		
Mortar type D2		1																																						(1)			
Grinding slab (metate)				1										1																						5		2						
Pitted stone				2								4		1		51				3																								
Grooved or notched net sinker	1			30	3	54		3				1								(601)								5(.61)						(+)										
Stemless stone pipe bowl	2		1					1																				6(3.690)																
Charmstone: sub-cylindrical, small		1		(+)		1		2												+								3(3/1)																
Slate or sandstone pendant	1			2																1		1						2(-/+)				1(-/+)												
Slate or sandstone ring or half ring	1	1		(3)	1	+														1		1						4(2/3)				(1) (/1)												
Stone earplug	1	+		+																		(2)						3(4/3)																
Large, non-stemmed points		++	+	+		+				?		?		?				+		1		++						(1)(/2)				1+		(+)										
Points of non-obsidian materials	2		+																	1								3(+/)																
Projectiles embedded in skeleton																												2(1/+)																
Obsidian prism, large	3			2										1		1												12(/)																
Olivella bead type 3b1	12	+		1		1		1																				4(6/1)																
Olivella bead type 3b2	18	+		1		5		4		1		1										2		2				7(13/11)																
Olivella bead type 3c	1																											1(3/1)																
Olivella bead type 3d	1																			1								5(7/)																
Haliotis bead type 4	1					2		2				1		1						1								2(/(+))																
Haliotis bead type 1	1	(+)				(+)																						1(/)																
Haliotis ornament type A1	2																											3(4/)																
Haliotis ornament type B2(1)	3											1		1														3(5/2)																
Haliotis ornament type C(1)a, C(1)d				(1)		1		1																				1(/1)																
Haliotis ornament type C(2)																												(5)(4/+)																
Perforated mica ornament	3			(1)		1		1												1				(1)				4(38/)	3(4/)			2		1								(1)		
Pourlerd red ocher	15	21	1		1																																							
Forked head-scratcher	1	1					1		1																			4(2/3)																
Spatulate bone hair pin	2	5	1	3		1		1		1																		5(6/8)																
Spatulate bone pendant		3	(1)		1		1																					3(1/4)																
"Shoehorn"-shaped spatula	2	2			2																							3(2/3)																
Spatulate antler/bone triangle	1	+		+		1	12	(1)		1				1		2		1		1		1		1		4		8(4/+)	3(1/+)			+										1		
Antler wedge																												1(1/)																
Mammal bone whistle		4		1																								4(/3)																
Two-piece barbed fish spear		1												1														1(/3)																
Compound-hook barb																												1(1/3)																
Atlatl tip (?)																												1(1/2)																
Fired clay figurine																												2(/2)																
Ringed dagger		1																										1(/1)																

* For shell bead and ornament types, see Lillard, Heizer, and Fenenga (1939). Mortar types are shown by Johnson (1942), except that his types B and C are here combined as type B and miniature mortars are called type C.

stricted to components of the interior throughout the Middle Horizon.

With virtually every one of the few (18) cremations, artifacts of some sort are included, whereas less than half of the burials of the Interior Province have any grave goods. The same restriction is true of burials from the Ellis Landing Facies of the Coastal Province. Although up to 70 per cent of the McClure Facies burials are accompanied by some form of grave goods, this frequently consists of no more than red ocher, an abundance of cut or unworked animal bones, or a few shell beads. These same items are the ones most frequently found with all burials of the horizon. When other artifacts do occur, they are frequently numerous and highly varied. In other words, considering only the uncremated burials, all settlements of the Middle Horizon strongly tend to distinguish a few select individuals by loading them with grave furniture and mortuary ornament, a necrologic practice that may reflect social privileges among the living.

From the viewpoint of archaeological classification, Middle Horizon traits known from burials or from the mound mass can be most conveniently divided into categories such as: traits unique to either province or to facies within a province; traits common to both provinces but limited to the Middle Horizon; traits shared with the Early or Late Horizon or both. Each of these categories would comprise a group of traits of significant size. (See, for example, Table 3.) However, in order to furnish a coherent picture of the life patterns of the Middle Horizon, its traits will be described instead as they throw light on the economic and social, ornamental, and ceremonial aspects of life. The attempt will be made in the course of this account to point out features relevant to the problems of classification.

Mortars and pestles are much more common than in the Early Horizon, though not abundant. The prominence of vegetal ash and charcoal in the midden deposits confirms the suggestion offered by the mortars that seeds, nuts, and other plant foods were more important to Middle Horizon than to Early Horizon diet. Pestles with polished chisel-shaped points, combined with rarity of large stone mortars in the stone-poor areas of the Interior Province, suggest the use of wooden mortars. Large stone mortars with round-pecked base and sides or with unshaped exterior are most common in the Ellis Landing Facies components, where they are up-ended over the heads or feet of burials. These also occur in the McClure Facies. Flat grinding slabs and grinding stones are known also from the Interior Province and from the Ellis Landing Facies of the coast. Miniature mortars, for use in grinding pigments or for macerating small rodents or birds, link the facies of both provinces.

Numerous hammerstones occur in Coastal Province components. These tend to be globular in the Ellis Landing Facies, ovate in the McClure Facies. Hammerstones with a pit in one or both faces, which may be anvils for acorn cracking, occasionally occur, especially in ocean shore locations. A series of crude picks and blunt choppers made of cryptocrystalline rocks comes from the McClure Facies.

Projectile points are related to those of the Early Horizon in size, since only a very few weigh less than 5 grams. Middle Horizon pointmakers, however, use obsidian more regularly, with minor percentages of chert, slate, and other materials, and tend to prefer stemless or even hollow-based points. Diagonal ripple-flaking on long blades is a special mark of the Interior Province, which also displays a larger variety of well-defined shapes; simple willow-leaf or laurel-leaf shapes characterize the Coastal Province. A broad, single-shouldered point may represent a special McClure Facies knife form. Small projectile points definitely made for arrows are absent, or at least not typical of the horizon as now known, although a series with long barbs is reported in association with Middle Horizon traits from two little-explored Sacramento Valley sites.[34] Use of the hand spear or casting lance is strongly indicated for Middle Horizon patterns of warfare, as well as for hunting, by the numerous blades or large points embedded in crania or body skeletons of burials, and many more in presumably lethal position within the body cavity. Although burials without skulls, as evidence of head taking, occur in the Early and Late Horizons as well as in the Middle Horizon, the high percentage of indisputably violent deaths indicated by embedded projectile points seems distinctive of the Middle Horizon at present accounting.

Fishing techniques are understandably more abundant in Coastal Province components,

[34] F. Fenenga (personal communication) notes such in the Augustine (C. 127) and Need #2 (unnumbered) components.

where the most common artifacts are notched or grooved stones which probably served as sinkers on nets. That these are much more common in certain coast components than in others is unexplained, unless net fishing might have been more appropriate in those localities.[25] Both line fishing and spear fishing probably were known in the Coastal Province, but were less favored, since only a few straight bipointed gorges and unilaterally barbed bone fish spear points for use in compound arrangement are known. Identical compound fish spear points and similar bipointed bones for gorges occur in greater numbers in Interior Province components, which, conversely, lack stone sinkers except for a single find of three very large grooved stones at Miller B (Site S1). Rectangular bone "mesh gauges" are known from both provinces and suggest use of nets. Clam baking with hot stones and seaweed is suggested by basins of baked earth found singly in this Ellis Landing Facies and in united clusters in the McClure B Component.

The abundance of sharp bone awls, in the face of their near absence during the Early Horizon, implies that coiled basketry either may have been introduced or first became well developed in the Middle Horizon. The awls characteristically have cleanly trimmed butts. Bone and antler implements of various shapes and uses become numerous: perforated needles, flat thatching needles, flakers, fleshers, knives, wedges, and deer scapulae with notched or scalloped blades.

Typical of the Middle Horizon are confusing assortments of bone and antler objects of ornamental, ceremonial, or conjectural use, of which each component produces new types as well as previously known ones. A small, bead-like antler tip, bullet shaped and notched transversely near the squared end, links the Ellis Landing Facies with the Interior Province. Socketed antler tools which may be knife handles form a similar link. Various facies exhibit elongate triangular spatulae of antler. Limited to Coastal Province components, however, are long, pointed, spatulate bone implements sometimes occurring in large numbers near the head of a burial. Some of these have fork-tined bases and may have been head scratchers; others have a ring at the base made by hollowing out the epiphysis of a split cannon bone; most, however, have rounded bases and only wrapping stains on the shaft to suggest a parallel to the feather-tufted hairpins of ethnographic times. The closest parallel from the Interior Province to the few perforated examples of these pointed bones are long pendants, incised and perforated with two holes near the non-pointed end. Undecorated bird bone beads and tubes, and grooved or perforated animal teeth are generally prevalent. Unique antler adzes and three small marked dice of bone are known from the Interior Province.[26]

Ornamental artifacts, especially shell bead and ornament forms, furnish the most unequivocal identification of Middle Horizon interments, as they do likewise of Early and Late Horizons. Small and large *Olivella* shell beads of saucer, elongate-saucer ("saddle"), and rounded rectangular shapes (Types 3c, 3b, and 3b2 respectively); circular or rounded rectangular beads of *Haliotis* shell (Types 3 and 4) are diagnostic. These occur as strings or sequins scattered over the burial. Large whole *Olivella* shell beads (Type 1b) carry over from the Early Horizon (where small, Type 1a, beads are far more usual) and survive into the Late Horizon. Distinctive *Haliotis* ornaments are circular with twin central perforations or with a large central orifice ("ring" shape). These may have radial incisions, as in the Early Horizon, or, most commonly, scalloped or notched rims. Concentric incised grooves mark the faces of some disc ornaments. Roughly rectangular and triangular forms, which are not distinctive, also occur. Changing trade relations may account for the Middle Horizon switch to a high percentage of green-backed *Haliotis* (*H. cracherodii*); this species is absent in Early and Late Horizons, at least in the Interior Zone, whereas it comprises one-half and one-third, respectively, of the specimens from the Interior and Coastal Provinces of the Middle Horizon.

Although the Coastal Province equals or surpasses the Interior Province in number, though not variety, of bone implements, there is no question of its inferiority in shell ornaments. Only the Emeryville Component (Site N309), largest of the San Francisco Bay settlements,

[25] Kroeber's tabulation (1925, Table 17, p. 932) of occurrences in nine San Francisco Bay sites shows the West Berkeley Component (N307) high above others.

[26] Fenenga (1940) gives a description and distribution of adzes; nearly identical dice from Basketmaker contexts in Arizona are figured in Culin, 1907, Fig. 7, and Kidder and Guernsey, 1919, Pl. 86, *g*.

compares favorably with any Interior Province community in number or variety of ornaments. Particularly common from this component is the coastal trait of beads ornamentally affixed with asphaltum mastic on shell and stone ornaments, mortars, and other objects.

Ring-shaped ornaments and elongate, spatula-like, perforated ornaments of slate are more numerous in the Interior Province, though known also on the coast. Small, round-edged, steatite beads are limited to the Interior Province, which also utilizes steatite for spool type earplugs; the latter, when found in coastal components, are generally of sandstone, available in the vicinity. Most distinctive of the Coastal Province, on the other hand, are roughly pentagonal ornaments of perforated mica and the prismatic obsidian splinters known as tinklers.[27] Only one occurrence of the former is noted in the Interior Province. The tinklers are absent from the Interior Province during the Middle Horizon, although they occur in the same area in both Early and Late Horizons. On the coast tinklers are found sometimes in large numbers near the skulls of burials. A related form, thoroughly retouched (to eliminate the dull surface produced by burning?), is noted in one ceremonial burial of the McClure Component, in which over 100 were grouped with some 60 of the problematical spatulate bone implements described above, quantities of red ocher and mica ornaments, eccentric forms of chipped obsidian, and shell beads. Ocher is most abundant in Coastal Province graves, but is noted in "beds" under Interior Province burials as well; its presence in graves becomes much rarer after the Middle Horizon.

Charmstones continue as ceremonial objects in the Interior Province, where the so-called "fishtail" form, a plummet shape with one terminus flattened, is distinctive. On the coast, however, most are found in the deposits without association and many are badly scarred or battered, as though put to rough practical uses.[28] Lack of clear associations makes difficult the isolation of forms unique to the horizon, although a pyriform shape with short stem is of common occurrence. The position of a single phallic charmstone from the Ellis Landing site on San Francisco Bay is somewhat questionable; it was found without association near the upper limit of a Middle Horizon deposit, and may more properly be grouped with phallic charmstones from the coastal components of the Late Horizon.

Ceremonial traits of the two Middle Horizon provinces frequently do not coincide. Shared traits include cup-shaped stone pipes or pipe-bowl inserts, bird bone (occasionally terrestrial mammal bone) tubular whistles, and unworked animal bones or teeth plentifully scattered through the burial fill. Polished, elongated, bird-bone tubes may have been used as drinking tubes or by shamans as sucking tubes. From Interior Province components are noted cracked quartz crystals and whole quartz crystals; cobblestone platforms laid below or above burials; red-ocher painting of small boulders, shell ornaments, or parts of the corpse; intentional breakage of various articles of grave furniture; and ceremonial burials of animals.[29] These traits are very rare or lacking in coastal components. Various Coastal Province traits mentioned above, such as the variety of spatulate bone implements (especially the forked "head scratcher"), retouched obsidian prismatic splinters, or quartz crystals and stone rings bearing asphalted appliqué of shell beads, may possibly have been part of the ceremonial dress or equipment. Most notable, however, are human figurines of baked clay unique to Coastal Province components, where baked clay in any other form is almost completely lacking.[30]

Baked clay in ball shapes, sometimes with grass or fiber impressions, definitely increases in use during the Middle Horizon in the Interior Province, where the balls appear to have

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[27] Use of these as tinklers on apron fringes is known only from northwestern California in the modern period (e.g., Kroeber, 1925, p. 76), but no other equally plausible uses have been suggested.

[28] Pennypacker (1938) suggests numerous uses for plummets (i.e., "charmstones"). A single function for all types at all times seems unlikely in view of the wide range of shape and finish in California specimens. The rough, battered, coastal types could well be regarded as line- or net-sinkers, but finely worked types occur later in the same area and must have had different uses, ceremonial among them.

[29] Heizer and Hewes (1940, p. 600, Table I) list occurrences of animal burials under "Transitional."

[30] One male, three female, and one questionable specimen, all fragmentary, are known from the Coastal Province area. The three female specimens, from the McClure Facies, have been described previously but not identified with the Middle Horizon (Heizer and Beardsley, 1942).

been substituted for stones for basket boiling and similar uses in the stone-poor delta land.[31] More elaborate examples occur in spool and discoidal shapes. Only fragmentary lumps and balls are known from the coast, although there are occasional bits of clay which apparently were used for wall or smoke-hole chinking or perhaps as plaster on stick and grass house coverings.

The above summary shows that traits of all phases of Middle Horizon culture have frequent parallels on both sides of the Coast Ranges. Altogether, the Interior Province is somewhat richer in number of artifact types and the artifacts are better made or more frequently ornamented than those of the Coastal Province.[32] The Coastal Province is not, however, simply a paler reflection of a dominant interior area, but has a consequential body of distinctive traits of its own. It is interesting to note that a few Early traits which disappear from the interior during the Middle Horizon but reappear in the Late Horizon, are present on the coast during the intervening time. These include the use of burned obsidian prisms as tinklers, attachment of beads to ornaments or other objects with asphaltum, and possibly phallic charmstones.

It should be emphasized that the Middle and Late Horizon components near San Francisco Bay have been defined by reanalysis of published reports and field data, and not by any recent excavations undertaken with this problem in view. The method of analysis, which emphasizes burial associations, has been briefly described above. It has not been possible to correlate the analysis based upon burial typology with stratigraphic levels in the San Francisco Bay mounds. Most field notes have no observations on stratification and one report denies any significance to the layers of shell in the mounds.[33] This has perhaps been some handicap to the analysis of the few sites in which clear stratification is present.[34] On the other hand, comparison of stratification and burials by inch levels in the Marin County coast sites having both Middle and Late components shows that Middle Horizon burials, as defined typologically, occur at slightly *higher* levels than the most obvious stratigraphic break in deposit. This phenomenon remains unexplained, but indicates that a clean correspondence is not to be anticipated between typological groupings and stratigraphic divisions.

For this and other reasons, it has been necessary to use double caution in dealing with all artifacts except those in burial association. When plotted by depth, however, the typological groupings of burials do show unmistakably the break between horizons.

A check of this burial-depth grouping from published reports is at present possible only in the case of the Emeryville site (N309). This shell mound was situated at the mouth of Temescal Creek on the east shore of San Francisco Bay. Its precise shape before the top was scraped level for a dance pavilion is unknown; maximum depth from this artificial surface was 32 feet, greatest of any known site in the bay area. The sides sloped steeply to make a truncated conical profile. Max Uhle excavated a broad trench on the west side and pushed a tunnel toward the center, finding ten burials.[35] W. Egbert Schenck and others salvaged what they could when the mound was leveled in 1924, recording 651 burials seen or recovered, then obtaining 34 more burials from trenches they dug in the deposit remaining below the modern ground surface. Of these nearly 700 burials, only 83 have records of associated grave goods.[36]

Forty-eight of the 83 burials are utilizable to determine the components represented in the site. All have depth data and one or more link traits are in each case specifically mentioned (4 by Uhle, 44 by Schenck). The remaining burials are not usable because of lack of depth data or of diagnostic artifact affiliation, but they do not in any way contradict the indications of the selected 48.

The schematic site profile (Fig. 3), on which burial locations are superimposed, shows the apparent line of cleavage, running from about 10 feet deep near the northwest side to about 14 feet near the southeast section of the mound.

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[31] Nordenskiöld (1930, pp. 33–4) suggested such a substitution, pointing out a baked-clay-ball—absence-of-stone correlation for the deltas of the Sacramento and Amazon rivers. Baked clay pot supports were found in a site similarly located in silt plains of the Sinaloa River, Mexico, by Eckholm (1942, p. 122).

[32] Incised ornament, in broad grooved lines, is applied to bone objects in Interior Province, but is all but restricted to female figurines of baked clay on the coast.

[33] Schenck, 1926, p. 169.

[34] Nelson, 1909, p. 374 and Pls. 39, 49.

[35] Uhle, 1907, burials described on pp. 27–30. Three burials from a subsequent shaft sunk by N. C. Nelson and others are unpublished and not taken into account here.

[36] Schenck, 1926, pp. 190–93, Tables 5–6.

The two components represented belong with the Ellis Landing Facies of the Middle Horizon (below the line of cleavage; 31 burials) and the Emeryville Facies of the Late Horizon (above the line of cleavage; 17 burials). Comparison of the artifacts known to have been found with these burials and the trait lists given in the present paper (Tables 3 and 4) indicates that the most complete consistency appears in the as Emeryville. The two estimates harmonize with each other and with the more recent work of S. F. Cook, who brings a physiologist's point of view to the question of daily dietary intake of shellfish for the average bay mound resident.[35] All three, when considering the total age of such a deposit as the Emeryville site, arrive at estimates which overlap at about the 4,000 year mark.

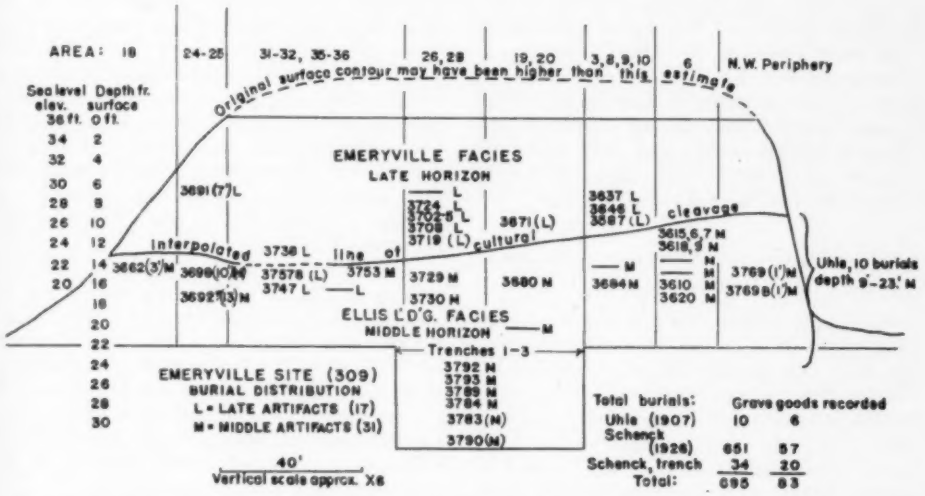

FIG. 3. Burial distribution plotted on SE-NW transect, for 48 burials with artifact association from Cone A, Emeryville site (309). Cultural attribution made on the basis of artifacts (data from Uhle, 1907, and Schenck, 1926). University of California Museum of Anthropology burial numbers. Note: Peripheral burials are assumed measured from the lower surface (*contra* Schenck, 1926, Table 5). Parenthesized symbol indicates doubtful attribution.

frequently recurrent shell bead and ornament types.

Some attempt at estimating the antiquity of San Francisco Bay shell mounds has been made in the past. With the identification of their lower components as Middle Horizon settlements, these dates may be taken as estimates of the antiquity of the Middle Horizon. N. C. Nelson and E. W. Gifford, in independent studies of shell mound contents, made total mass a measure of total age.[37] They computed the daily accumulation of deposit per individual and multiplied that figure by the estimated number of inhabitants. Nelson's estimate was made in terms of volume, for Ellis Landing; and Gifford's, in terms of weight for such a site

In 1946, the discovery of burials at the base of a swimming pool excavation north of the town of Walnut Creek, 10 miles inland from San Francisco Bay, was reported to the University of California. Investigation of the report showed that indurated midden deposit lay buried 4 feet beneath the sterile estuarine (?) sediments of the valley floor. A field party from the university under the direction of R. F. Heizer suceeded in recovering ten burials, of which three were accompanied by artifacts of Middle Horizon affiliation. A report on the finds at this locality, which bears the name Monument site, is in preparation. The subsurface location of this and three similarly buried midden deposits discovered subse-

[37] Nelson, 1909, p. 346; Gifford, 1916, pp. 12–14.

[38] Cook, 1946, p. 51.

quently within a 5-mile radius was of extreme interest, and led to pedologic examination of the soil overlying the sites. The preliminary report gives an estimated period of 4,000 to 8,000 years as indispensable to the development of a mature ("Tierra") profile in the sterile sediments.

Quite different approaches thus coincide in estimating separate Middle Horizon components to be somewhere around 4,000 years old. If one inclines toward accepting minimal dating of American cultures, this figure seems to exceed what would be expected in relation to other areas. But the common figure offered by these dating methods is not to be lightly brushed aside. While they are only estimated dates, presented tentatively, they point the way to a possibly fruitful approach toward chronological ordering of the older sites.

LATE HORIZON: COLUSA, COSUMNES, ALAMEDA, AND MARIN PROVINCES

Population changes in Central California seem, in the main, to have ceased by the opening of the Late Horizon. In major respects the culture of the Indians inhabiting the coast and interior in ethnographic times runs in full continuity from the earliest phase of this latest period. But even within the Late Horizon no claim of a static and changeless culture can be made. Instead of two provinces, four are distinguishable, each with two sequential facies. The Colusa Province, represented by the Sandhill Facies followed by the Miller Facies, occupies the Sacramento Valley north of the town of Knight's Landing. The Cosumnes Province, with the Hollister followed by the Mosher Facies, stretches through the delta region southward from the city of Sacramento. The Alameda Province, with the Emeryville followed by the Fernandez Facies, encompasses San Francisco Bay. The Marin County coast to the north has the Mendoza followed by the Estero Facies. (See Table 1.)

The earlier facies in all four provinces are linked together as Phase 1 of the Late Horizon, which is entirely prehistoric. The later facies, which constitute Phase 2 of the Late Horizon, are of protohistoric date and include contact materials dating to 1595 on the Marin County coast. The full historic period following this, marked by association of trade beads, iron objects, shovel-dug graves, bottle glass arrowpoints, and the like, has sometimes been called Phase 3. In the classification used in this paper it is not segregated from the facies of Phase 2 because the Indian elements of culture were not greatly altered before their eventual disappearance.

Interior sites are uniformly located along stream banks or overflow areas and have very slight or no trace of lime cementing of the deposits. Ash, charcoal, and bone fragments are abundant in the black "greasy" soil of the Interior Zone middens. Shell is mixed in large fragments with blackish soil in the Coastal Zone shell mounds. Most coastal settlements overlie Middle Horizon components at stream mouths or in sheltered coves. Many sites in both zones have only thin deposits, but certain ones extend to depths of 12 feet or more, not only along the coast where the shells pile up rapidly but also in the interior where ashy dirt is the principal element.

Mesocephaly perseveres without definable change in Alameda Province according to measurements available at present. In Cosumnes Province, however, a change toward brachycephaly appears to be a continuation of trends observed in Middle Horizon skeletal materials.[39] Studies now in progress on Marin coast crania and Sacramento Valley skeletons should throw welcome light on some of the problems of archaeological and ethnic relationships.

A good many traits are close parallels to those of Middle Horizon: flexed primary burial, bone basketry awls, bone whistles, bipointed gorges, simple shapes and radial incision of shell ornaments, whole *Olivella* shell beads, and occasional large stone projectile points. Cosumnes Province, in particular, carries over cremation, baked clay objects, animal burials, perforated stone discoidals, chisel-pointed pestles, and possibly cylindrical earplugs, as well as the trait of "killing" objects included in burials. Certain traits, indeed, go clear back to the Early Horizon, though with variations: awls, gorges, radial incision of *Haliotis* ornaments, whole *Olivella* beads, large points, and "killed" grave goods.

It may be seen from the greater number of provinces that areal differentiation is more evident in the Late Horizon than during former periods. However, from the beginning of Late Horizon times certain important changes link

[39] Lillard, Heizer, and Fenenga, 1939, p. 73.

together all of the provinces (Table 4). Small obsidian arrow points, weighing less than 5 grams, appear for the first time and abound in most components. These are triangular, stemmed, and often serrated. Mortars become numerous and large. Long, tubular, steatite pipes appear. Increased use of shell ornaments is coupled with greater variety of decoration; and it is new types of shell beads again, with associated ornamental traits, that particularly distinguish the phases of the horizon.

LATE HORIZON: PHASE 1

Burial position and orientation in the two coastal provinces carry over without notable change from the Middle Horizon, except that semi-flexure is rare and semi-extension is apparently absent. Cremation is introduced into Marin Province, perhaps coming from the interior, where it now continues from the Middle Horizon. Flexed burial in a general westerly orientation, however, continues to be most important in both areas. Artifacts accompany a

TABLE 4. SELECTED LATE HORIZON TRAITS, SAN FRANCISCO BAY AREA SITES
(See Table 3 for legend.)

	Summary Late Horizon Site (Burial/Depos.)	*Summary Middle Horizon Site (Burial/Depos.)*	Glen Cove ?		Emeryville 0'–10'/14'		Ellis Ldg. 0'–4'/6'		Bayshore 0'–5'		Ponce 0'–5'		Greenbrae 0'–5'/6'		San Rafael 0'–3'/5'		Fernandez 0'–5'/6'		Newark 0'–3'/4'	
			B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D	B	D
Mortar type A1a	3(1/6)		1	(1)		3								2						
Mortar type A1b	4(1/5)			1				2						2			1			
Tubular stone pipe	4(4/5)				2	+	1	(2)		1							1			
Charmstone: piled plummet b	3(2/1)				1		(+)					(1)								
Charmstone: knob-piled plummet	2(2/1)						1	1			1									
Charmstone: asymmetric spindle b	3(4/5)		4	3		+									1					
Small, stemmed points	3(6/+)			+				+									6	+		
"Stockton curve" obsidian	1(/1)																	1		
Square serrated points	2(/3)			2														(+)		
Obsidian prism, small	2(3/1)		1														2	1		
Clam disc bead	3(8/1)	(1)(/1)*						1									7		1	
Olivella bead type 2a	6(28/)		7		12				3		2		3				1			
Olivella bead type 3a1	3(7/1)							1									6		1	
Olivella type bead 3a2	1(1/)																1			
Olivella bead type 3e	1(2/)				2															
Haliotis ornament t. E1a	1(1/)				1															
Haliotis ornament t. F1/3	3(5/)		3		1								1							
Haliotis ornament t. F—e	1(1/)				1															
Haliotis ornament t. G1G	1(1/)				1															
Magnes./steat. tube beads	1(6/)																6			
Incised bird bone tube	3(2/2)							1									2			1
Bird bone whistle	5(5/5)	2(4/)**	1	3	1			1	2								1	1		
Waisted bird bone bead	2(2/)		1														1			
Pair (?) incised cannon bones	1(1/)		1																	
One-piece, barbed fish spear	1(1/)		1																	
Burned basketry/featherwork	1(2/)		2																	

* West Berkeley, no location.
** Emeryville, Ellis Landing, below 10 ft. depth.

high percentage of the cremations, but only 50 to 65 per cent of the unburned dead. Especially in Cosumnes Province, burials are found which have charred basketry, fibers, acorns, and other remains below the skeleton, indicating pre-interment burning of offerings in the grave pit.

Shell ornaments and beads are included with interments in greater number and variety, especially in Cosumnes Province. The diagnostic Phase 1 bead type is a small rectangular *Olivella* bead (Type 2), drilled at the center or at one end and frequently laid in shingled rows on the skull or on carbonized textile. These are often accompanied in burials by whole *Olivella* beads (used continuously since Early times). New *Haliotis* ornament shapes include the "banjo," which may represent the important Big Head dancer of the Kuksu cult;[40] only simple versions of this shape occur on the coast. Incisions forming a split V appear around the edges of ornaments. Additional decorative objects are tubular bird-bone ear or hair ornaments covered from end to end with repetitive geometric patterns in fine line incision; the focus of this art form is clearly in Cosumnes Province, although crude specimens appear elsewhere and become more frequent in Phase 2. Bone beads sometimes have constricted waists. Red ocher is infrequent and in lumps more often than in powdered form. Thus in ornament as in burial customs, the reinterpretation of Middle Horizon habits is noteworthy.

Late Horizon objects which are "killed" in graves are more frequently domestic utensils than ceremonial or ornamental objects as previously. These domestic implements show full emphasis on techniques of preparing seeds and acorns, i.e., charred baskets, mortars, and pestles. In Cosumnes, Alameda, and Marin Provinces there appears a large, artistically proportioned mortar with flat bottom, straight or flared sides, and beveled rim. Cosumnes Province pestles may be elongated and have flanges or knobs near the hand grip.

In the Cosumnes Province fishing implements include bilaterally barbed one-piece spears as well as the gorge hooks of the Middle Horizon. The use of stone sinkers seems to be restricted in the interior and limited or absent in the coastal provinces, especially Marin County. Spool-shaped or other baked clay forms may have supplemented flat notched stones in this capacity in the Cosumnes Province. In all areas, the bow and arrow with small point is the dominant hunting device. Although large points still occur, some of gigantic size suggest that they were made for ceremony or display as well as for actual use.

Charmstones remain an important ceremonial item to the last. Although shapes differ, in all periods in the Sacramento Valley charmstones are well made and artistically finished. In Alameda Province the same is true only of Late Horizon charmstones which are long, tapered forms resembling those from the Interior. Phallic charmstones appear in both coastal and interior components. Other ceremonial objects include: quartz crystals, paired bird bone whistles (with stops medially placed on outside curve), the biconically drilled tubular pipes of schist or steatite mentioned above, and clusters of bird wing bones found with burials of Alameda Province components.

Only one Phase 1 component of the Late Horizon is known in the Marin Province, where excavation has been limited. Phase 1 settlements of the Late Horizon are found in all parts of the San Francisco Bay area, as well as being well represented in interior provinces. At least seven Alameda Province sites contain Phase 1 remains. One of these sites (Glen Cove, Site N326) is a single-component site and closest culturally as well as geographically to the Phase 1 settlements of the Cosumnes Province. The remainder are superimposed on Middle Horizon components, and have been segregated through typological analysis of burials as described above.

LATE HORIZON: PHASE 2

Only two Phase 2 components are known in the San Francisco Bay area, although settlements of the same period are numerous in other areas. These two components, Newark (N328) and Fernandez (N260), are at some distance from each other and not close to the bay shore (Fig. 1). It is not yet clear why so few Phase 2 remains should be known from Alameda Province. In Marin Province, at least, this phase was in progress almost two centuries before Spanish colonization of San Francisco Bay in 1776; Chinese porcelain and iron spikes taken from Phase 2 components near Drake's Bay date from the wreck of the Manila galleon

[40] Kroeber (1925, p. 261 and Pl. 77) describes and illustrates the large feather headdress of Pomo and Patwin dancers.

San Agustín on that shore in 1595.[41] It may be that San Francisco Bay Indians during these two centuries failed to acquire the new ornament styles developed elsewhere. Or, on the other hand, additional Phase 2 sites may actually exist undiscovered on the now industrialized shores of the bay. Heizer's argument that the Phase 2 remains in the Sacramento Valley do not antedate 1790[42] supports the first of these possibilities. The dating problem cannot be solved with present information, but it should be observed that the recognition of Late Horizon phases in coastal sites, whereas only interior sites had been known before, brings the problem into clearer perspective.

The most common marker trait for Phase 2 is a disc bead made from clam (*Saxidomus nuttali*), in late times a monopoly of the Pomo and Coast Miwok north of Marin County.[43] Other ornamental traits are linked with clam disc beads in a complex which recurs in all four provinces: small, cupped *Olivella* beads (Type 3a1), steatite disc beads, and tubular beads made from magnesite, steatite, and the shell of a more southerly clam (*Tivela stultorum*). Clam disc beads were used and traded very widely through California in historic times as articles of standard value, creating a generally recognized form of currency. In coastal archaeological components they occur in no greater quantities than other grave goods, but in the richer interior settlements, where their value is perhaps increased by distance from the source, they are found piled in lengthy strings on burials of all sexes and ages.[44]

Cosumnes Province in the Sacramento River delta is not only rich in traded items. Its status of superiority in material goods is enhanced by the appearance of several unique traits: dentate semilunar "Stockton curves" of obsidian, wooden fishhooks, whistles of incised bird bone, and bird effigies of baked clay. Three additional items—turquoise disc beads; flat, ovoid *Tivela* clam beads; and three-quarter grooved axes[45]—signal relations set up also with the south.

In Cosumnes Province, thus, we find throughout the Late Horizon a culture climax which moved only slightly north to the territory of the Patwin in ethnographic times, according to Kroeber's estimate.[46] Cosumnes Province is notable for the development in Phase 1 (Hollister Facies) of many special traits which only gradually and selectively spread to other areas. Exchanges in return seem relatively rare. This interchange of elements operated more along an east-west axis than along the north-south axis, affecting Alameda Province somewhat less extensively than Marin Province. Colusa Province, for example, is excluded from the following traits which link the other areas within Phase 1: cremation, pre-interment burning of offerings in the grave pit, flat based mortars with straight or flaring sides, flat based pestles (some with knobbed or flanged grip), "banjo"-shaped *Haliotis* ornaments, bone tubes with constricted waists, and bilaterally barbed one-piece fish spears. Traits which are exclusive to the Hollister Facies of Phase 1, but which had spread west or north by Phase 2, include: square serration of projectile points, fine-line incising on bird-bone tubes, and variously elaborated baked clay forms (limited to the interior provinces throughout).

It is essentially the unchanged cultural assemblage of Phase 2, including elements of the clam disc complex, into which materials of European manufacture are introduced during the historic period. Glass trade beads from Spanish and Hudson's Bay Company sources, metal knives, files, and other evidence of continuous contact with the whites are found. Within a very short time after the truly historic period began in each area, native culture was disrupted as some groups were missionized and others fled from the vicinity of the Spanish missions, founded at San Francisco in 1776, at San Jose in 1797, and at San Rafael in 1818. Heizer has presented evidence of the widespread and important repercussions which the Spanish soldier-missionary culture brought to the interior tribes during a protohistoric period, initiated before close or permanent contact had

[41] Heizer, 1941*b*. It should be noted that the principal Phase 2 burial-associated traits of these components are of the clam disc bead complex; in ethnographic times, the coast not far north was the source of clam disc beads.

[42] Heizer, 1941*a*, p. 118 *et passim*.

[43] Loeb, 1926, p. 176.

[44] The Drake accounts (Heizer, 1947, p. 266) attribute clam disc bead "chaines" principally to chiefs, which squares fairly well with archaeological evidence. Greater abundance in interior components might mean substantially later date rather than greater contemporaneous demand; cross ties with other traits, however, are difficult to reconcile with this interpretation of the evidence.

[45] Heizer, 1946.

[46] Kroeber, 1936*b*, p. 112.

been established.[47] These repercussions entailed disruption of established patterns and migration of total communities. The time period is too short, however, to permit archaeological evaluation, at this point, of changes wrought in the aboriginal culture by actual contact. Only a few shifts are suggested: increase in the frequency of cremation, wider use of clam disc beads, and the dissemination of a few other ornamental, cult-connected items. These are but continuations of trends which had begun during prehistoric times. The Indian culture was not long in vanishing: probably shortly after 1776 on San Francisco Bay, by 1830 at the latest in the Sacramento Valley,[48] and probably after 1860 on the Marin County coast.

SUMMARY

Important changes are discernible in the prehistoric culture of Central California. Three sequential culture horizons stand out, with close and explicit relationships in each of three separate physiographic areas for which we have adequate data: the Sacramento River Valley, San Francisco Bay, and the ocean coast of Marin County (Fig. 1). A systematic arrangement of culturally defined facies into provinces under each of these culture horizons has been presented (Table 1).

The longest record of human habitation is in the Sacramento Valley, where the Windmiller Facies of the Early Horizon exists under circumstances suggesting very considerable antiquity. On the coast, except for traces at the base of certain sites near San Francisco Bay, the remains of this hunting and gathering culture, with its elaborately ritualized burial practices, are yet undiscovered.

After an interval of unknown duration, the Early Horizon is replaced by the Middle Horizon, a culture of different orientations and interests. Its presence is attested not only in the Sacramento Valley, where five separate facies are discernible, but also on the coast, where littoral adaptations of culture link two facies into the Coastal Province, presumably synchronous with the Interior Province. Underneath much variation from site to site and area to area is a broad uniformity in the techniques which Middle Horizon people employed to gather and prepare their food, the weapons they used, the sociological rating they gave to warfare, the ornaments with which they adorned themselves, and the conventions with which they approached death. They are not simply intruders independent of earlier inhabitants and divorced from those who replaced them; they carry traits over from the Early Horizon and likewise preserve or add some for transmission to the Late Horizon.

In the Late Horizon the acorn-gathering patterns are consolidated still more thoroughly,[49] and traits regarded as fundamental to the ethnographic Indian tribes of California are either added to the culture (such as the bow and small pointed arrow) or developed to their final proportions (such as shell ornaments). In each of the four provinces of Marin, Alameda, Cosumnes, and Colusa, two sequential facies can be delineated. Although the basic patterns of Late Horizon are established in the earliest of these facies and continue with few rejections to historic times, specific trait parallels link the earliest facies of all the provinces into what has been termed Phase 1, and all the later facies into Phase 2 of the Late Horizon.

We have a clearer idea of the nature of the later archaeological periods than of the earlier ones, but even for the latest times unsolved problems of extreme interest are more clearly defined by the extension of archaeological perspective to include the coast (Pl. I). The dynamics of culture change in Central California are but poorly understood. The dominance of valley over coast is expressed in greater quantities of shared items and higher frequencies of unique traits in the valley; however, the role of initiator *versus* receptor is less sharply defined in the Middle than in the Late Horizon. The Interior Province of the Middle Horizon achieves superior rank less through groups of peculiar traits than through frequent display of traits which are common to both provinces. The culture climax area of the Late Horizon is clearly in Cosumnes Province of the lower Sacramento Valley, somewhat south of the Patwin climax of ethnographic times, in territory lacking recorded ethnographic detail. This sort of qualitative areal relationship, together with problems of direction of cultural exchange, will be much more readily evaluated when excavation has revealed the standing of intervening areas.

[47] Heizer, 1941*a*; Cook, 1943, pp. 3–5 *et passim*.

[48] Heizer, 1941*a*, p. 118.

[49] Gifford, 1936, p. 87.

CALIFORNIA AND NORTH AMERICA

The cultural horizons of Central California, as described in this paper, show interesting parallels not only to other areas in California but to wider areas in North America as well. In California, programs of excavation near Santa Barbara on the coast of south central California and in the southern San Joaquin Valley have revealed culture sequences which bear quite recognizable resemblances to the cultural horizons of Central California.[50] Referring to the resemblances of these sequences with the lower Sacramento Valley, Heizer and Fenenga wrote, "cultural development in certain California areas has apparently not been autochthonous, but in at least the three areas outlined above there has been a parallel succession, thus making it a general California phenomenon, further evidence of which we may expect when additional areas are investigated carefully."[51] More detailed comparative analysis than theirs has not since been made, but increasing information supports their conclusion. Their tentative table of cultural synchronisms places the Santa Barbara Oak Grove culture of the mainland at an earlier position than the Sacramento Valley Early Horizon, and brackets successively later Santa Barbara periods with the Early, Transitional (now Middle), and Late Horizons. The Oak Grove culture thereby becomes a contender with the San Dieguito Plateau lithic industry of Southern California[52] for the earliest position in the definitely post-Pleistocene series of cultural developments in the state.

The southern San Joaquin Valley sequence near Buena Vista Lake, now known from final reports, begins with very scant evidence of an Early period which may be coeval with either the Early or Middle Horizons of Central California. Small, triangular projectile points, perforated steatite discoidals, multiple perforation of *Haliotis* ornaments, and shell bead types suggest that the Buena Vista Intermediate is at least partly on the level of the Central California Late Horizon, Phase 1, although artifact types reminiscent of the Middle Horizon also appear. Buena Vista Late has bead types, including clam shell disc beads, as links with the Late Horizon, Phase 2.[53] The historic cemetery at Elk Hills in the same area shows many of the Buena Vista Late traits occurring in association with European goods.[54] Thus the trait linkages from this area, added to those of Santa Barbara, justify confidence that the cultural horizons defined in Central California are much more than local phenomena.

Attempts to relate these harmonizing culture sequences of California with archaeological periods elsewhere must be made solely on the basis of trait comparisons, until such time as internal dating makes absolute chronologies more reliable for comparing separate areas. Any list of parallels, of course, may be met with the reminder that correspondences between distantly separated areas do not guarantee contemporaneity; nor, in the case of simple traits, do they even guarantee derivation from a single source. These qualifications have made it all the easier for parallels outside California to be swallowed up in the abundance of evidence for the isolated marginal development of native culture within the state. Yet it has never been denied that the West Coast must have participated to some degree in the cultural history of North America as a whole. On the contrary, specific traces of common cultural heritage have been singled out by several investigators.

Influences from the Southwest appear in both the ethnographic and archaeological records. Southwestern items such as cotton blankets, occasional pottery, and grooved axes were apparently imported by trading expeditions at various times ranging at least over the past thousand years.[55] Shell beads of *Haliotis* and *Olivella*, turquoise, and probably other commodities were returned in exchange. Underlying these indications of primary diffusion, however,

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[50] For the Santa Barbara area, see D. B. Rogers, 1929, and Olson, 1930; for the southern San Joaquin Valley area, see Stirling, 1935, Wedel, 1941, and Walker, 1947.

[51] Heizer and Fenenga, 1939, p. 397.

[52] Malcolm Rogers, 1939.

[53] Wedel, 1941, and Walker, 1947. The above provisional interpretation of time relations differs from Wedel's opinion (pp. 145–8) in shifting the Buena Vista sequence up one step later in the scale. Wedel compares Buena Vista Early with Sacramento Early and with the Oak Grove culture of Santa Barbara, and regards his Buena Vista Late as equivalent to the entire Late Horizon of the Sacramento area. His arrangement is followed in subsequent reviews of the area (e.g., Martin, Quimby and Collier, 1946, p. 440, Chart XV).

[54] Walker, 1947.

[55] Heizer, 1946, pp. 190–1. Full bibliography and discussion of Southwest-California parallels is given in this paper.

are traces of connection of a more enduring nature between the Southwest and both Southern and Central California. Certain cult resemblances listed by Loeb led Kroeber to propose that the roots of this connection began "at an early date, long before Pueblo cults had taken their specific form."[56] The purposes of this paper will be served by listing only the parallels from archaeological data. The most specific of these, noted in previous pages, include fired clay female figurines, marked bone dice, tubular pipes of "cloud blower" form, and rectangular stone palettes with raised rims. Each of these types, which appear in Basketmaker or similarly early context in the Southwest, constitutes a quite specific parallel. But each is also exceedingly rare in Central California archaeology and, except for the pipe, hardly integral to California culture patterns. These few archaeological parallels might be regarded as incidental reflections of trade and occasional contact were it not that the much larger number of ethnographic parallels implies more deep-seated connection.

Of other archaeological parallels which suggest a more basic linkage, such as the use of large, heavy projectile points (with spear thrower association verified in the Southwest) before small, light points appear, and the early habit of rotary grinding motion which produced seed slabs with oval depressions, it has been pointed out that they are parallels in a much broader frame of reference.[57] On the basis of these widespread traits, California is not linked with the Southwest alone, but is brought into the problem of the development of culture on the North American continent as a whole.

Among others, William Haag opens an interesting line of inquiry into this problem with the suggestion made in his "Early Horizons of the Southeast" that the shell-heap inhabitants of California and the southeastern states alike may be the descendants of immigrants who "came into North America at a relatively early period, but still long after the Folsom-Yuma peoples, spreading throughout the continents, some populating the Pacific Coast, some continuing on to the southern tip of South America, some moving across the High Plains into the Mississippi Valley, here to move both eastward and southeastward to leave their remains wherever conditions were favorable."[58] Admitting many cultural changes under differing ecological conditions, Haag nonetheless is able to list twelve traits of the shell-mound horizon of the Southeast with general or specific counterparts in the Santa Barbara area. Without transcending the limits of this paper, this suggestion may be examined briefly from the viewpoint of Central California archaeology.[59]

The traits which find analogs in the preagricultural horizon of the eastern United States are known from the Early or, at the latest, Middle Horizon of Central California. The Eastern cultural units, collectively referred to by Webb, Haag, and others as "Archaic" and more recently by Griffin as "Paleo-Indian," precede or, in some cases, appear to straddle the time of introduction of pottery; there are suggestions that materials known at present give a fair picture of only the later stages of this horizon.[60] The named cultural units include the Red Paint of Maine; Lamoka, Frontenac, and Laurentian of New York; Dubois of Indiana; Indian Knoll of Ohio and Kentucky; Eva of Tennessee; Lauderdale of Alabama; Savannah River of Georgia; and Poverty Point, Copell, and Tchefuncte of Louisiana.

The parallel traits should be divided into several groups, according to their varying degrees of potential historical significance. One group perhaps reflects a general level of cultural development more than specific genetic relationship, since it is repeated in the archaeological inventory of a very wide, intercontinental series of cultures. This group includes burial of the dead, generally in flexed position, in shallow pits dug in the vicinity of the village; the digging of similar pits for refuse or for caching

[56] Loeb, 1926, pp. 21, 133–4; Kroeber, 1932, p. 417.

[57] Krieger, 1946, pp. 47, 51.

[58] Haag, 1942, p. 222.

[59] Specific reference to Santa Barbara and San Joaquin Valley area materials is omitted here, but both areas are included by implication in the following inferences of cultural relationship proposed for Central California.

[60] Webb and Haag, 1940, p. 109; Ritchie, 1944, p. 5; Griffin, 1946, pp. 40–3. Of the units listed here, Lamoka Focus is considered to be representative of a period earlier than the others, and Tchefuncte is probably later. As regards the eastern time level at which comparisons are made, it is true that certain trait parallels occur also in later agricultural levels, though more sporadically and in smaller groups. It seems a justifiable assumption, however, that the time level at which comparable traits appear *first and in the greatest number* is the level likely to be most closely related. Survival of traits on either side of the continent has little bearing on their derivation.

special objects; the scattering of ocher in graves; the use of stone for tubular or round beads, and of shell for disc beads and ornaments; and the manufacture of awls, flakers, needles, beads, and whistles from deer bone.[61] In this group, exceptions may be more significant than the rule. California's Early Horizon and (so far as limited data allow any statement) Oak Grove and San Joaquin Early provide such exceptions: sharp pointed awls and whistles, for example, are extremely rare or absent, and in place of flexed burial, the distinctive custom of burial extended and face down is the rule. These features are difficult to evaluate; they suggest that the earliest known Central California horizon is more distantly related to the eastern Paleo-Indian level than is the Middle Horizon, and became isolated on the West Coast before development of these traits made their interchange possible.

A second group of traits poses problems of evaluation in that its elements are rare or absent except where local environment permits or stimulates their development. The baked clay objects of the lower Sacramento River region, in the Early and subsequent horizons, have analogs in Poverty Point and the Tchefuncte Focus of Louisiana.[62] An adequate stimulus in either area might be the lack of stone for stone-boiling, basket-rests, or other uses. Again, vessels of steatite and other soft stone are most abundant near soft stone outcrops and may be absent elsewhere for lack of material rather than absence of the tradition. In California they appear only in the Santa Barbara area as early as Middle Horizon, but they are early at Poverty Point, Tchefuncte (?), Lauderdale, Indian Knoll, and probably along the Atlantic coast.[63] The generally common California trait of affixing shell beads to bone and stone implements or to shell ornaments, noted since Early Horizon times, I have found paralleled only in the Indian Knoll Focus of Kentucky,[64] and I have wondered whether availability of asphaltum or other permanent mastic may account for the restriction of this trait. In the same way, quartz crystals and simple mica ornaments are even more rare and sporadically distributed through the East than in Central California, and seem, moreover, to have been noted consistently so far only in early ceramic levels.[65]

The third and largest group of traits seems potentially most significant in indicating genetic relationship. The fifteen traits listed here are not necessarily exhaustive nor equally valid; some preferably may be relegated to one of the categories previously mentioned. I do not insist on the present grouping except to maintain that it will retain a core of elements which are not simply referable to environmental conditions or to a generally low cultural level.

The stone artifacts of the third group include the charmstone (or "plummet" of Eastern archaeology); unspecialized mortar; simple conical, cylindrical, or bell-shaped pestle; large, stemmed points and leaf-shaped blades; and possibly boatstones. The charmstone is an artifact type which well illustrates for the whole group the difficulty of pinning these traits down to a clear-cut pattern of relationship. In the first place, the use of charmstones is unknown and must be guessed at.[66] They are most abundant and show the richest variety of forms on the West Coast but they recur, though with puzzling gaps, in preceramic or early ceramic context in Atlantic Coast states from Maine to Georgia, as well as inland to the Tennessee River.[67] In states along the Ohio River, however, they seem to be unknown before the Adena ceramic period.[68] Of plummets found along the seaboards of Venezuela, Brazil, Chile, or Peru, or the analogous forms in bone found in prehistoric Eskimo sites,[69] nothing but the tremendous expanse of territory involved in

[61] Cf., e.g., Webb and DeJarnette, 1942, Table 43 (Lauderdale).

[62] Moore, 1913, pp. 64–76; Ford and Quimby, 1945, p. 5, Pl. I.

[63] Olson, 1930, p. 17 (Intermediate Mainland Period); Webb, C., 1944; Ford and Quimby, 1945, p. 41 (one fragment); Webb and DeJarnette, 1942, pp. 76–7, 117–18; Webb and Haag, 1947, p. 24; Fowler, 1947.

[64] W. S. Webb, 1946, p. 292, Pl. 51, *a*.

[65] Griffin, 1946, p. 49.

[66] See Fn. 28, above.

[67] Willoughby, 1935, pp. 41–9 ("Pre-Algonquian"); Hadlock, 1941, p. 159 (Red Paint); Byers and Johnson, 1940, p. 50 (Shellmound, unnamed); Ritchie, 1944, p. 381 (Frontenac); Caldwell, N.D. (Deptford, one plummet); Ford and Quimby, 1945, p. 40 (Tchefuncte); Joffre Coe, personal communication (North Carolina Archaic); Webb, C., 1944, p. 386 (Poverty Point); Webb and DeJarnette, 1942, p. 88 (Lauderdale).

[68] E.g., Martin, Quimby, and Collier, 1946, p. 291 (Baumer).

[69] DeBooy, 1926, Pl. IV, *a;* Serrano, 1946, Pl. 80; Bird, 1943, p. 260 (these are demonstrably used as fishhook sinkers); Nordenskiöld, 1924, p. 101, Map 10 (citing Uhle); Collins, 1939, Pl. 36.

their distribution really warrants their exclusion from any hypothesis of a genetic linkage among North American plummets as a whole. Whether or not the South American and Eskimo forms are genetically linked to the others, an argument favoring linkage of eastern and western North American types is presented by nearly identical shapes such as the re-curved or stemmed types of California and Maine[70] or the phallic representations known from California and New York.[71]

The unspecialized mortar of the Early Horizon grades into the grinding slab category, and contrasts much less strongly with the grinding equipment of Cochise or early Anasazi[72] than it does with either the later specialized metate of the Southwest or the equally differentiated and elaborated mortars of later Central California horizons. Such undifferentiated mortars are not uncommon in the East,[73] although pestles of simple conical, cylindrical, or bell shape[74] are found even more widely than the mortar, presumably because the Southeast tended to substitute wooden mortars for stone. The small, pecked pits of uncertain function noted on the sides of pestles as well as on discoid hammerstones and other objects in California are also reminiscent of pitted hammerstones and of the so-called "nutstones," "anvils," and "cupstones" well distributed through the East.[75]

Better evidence for use of the spear thrower comes from the Southeast than from California.[76] In each area, as in the Southwest, small, light projectile points join or replace a complex of large, stemmed points and leaf-shaped blades only at a relatively recent date.[77] Peculiarly shaped, small bone or antler tips from the Middle Horizon possibly may be analogous to the bone atlatl hooks of the Southeast.[78] Although a fragmentary boatstone-like object tentatively assignable to the Middle Horizon is known in the Sacramento Valley, the series of elongated "boatstones" from one area of the southern San Joaquin Valley which offers the nearest parallel to the boatstones of eastern states comes only from surface collections, unfortunately, and cannot be dated.[79] These items are not sufficient to certify use of the spear thrower at any period in California, yet they contribute definitely if tantalizingly to correspondences with the East.

Among parallel artifacts or traits of bonework, the less specific items include the use of perforated or grooved canine teeth of bears and other carnivores, or the inclusion in burials of cut animal jaws. Early in California, these are also known from the Brewerton Focus and the earlier Lamoka Focus in New York, and from pre-pottery sites in Indiana, Ohio, Kentucky, Tennessee, and Alabama.[80] Hook and line fishing, using an angular curved hook or a gorge hook or both, seems to be known in all these cultural units where the data are sufficient, though the Eastern forms of angular fishhook resemble each other more closely than they do the California type.[81]

Certain bone objects apparently made for ceremonial purposes seem beyond the possibility of independent development through similar environment or similar low cultural level, and consequently especially appropriate for comparison. The human bone artifacts de-

[70] Willoughby, 1935; Fig. 24, *j*, *m*, *o*, *t*, and Fig. 27 (Red Paint).

[71] W. M. Beauchamp, 1897, p. 41, Fig. 90 (not placed in cultural unit).

[72] McGregor, 1941, p. 116, Fn.; p. 213.

[73] Ritchie, 1944, pp. 375, 381, 388 (Brewerton, Fronetnac, Lamoka); Martin, Quimby, and Collier, 1946, p. 373 (Savannah River); Ford and Quimby, 1945, p. 40 (Tchefuncte); Lewis and Kneberg, 1947, p. 16 (Eva).

[74] Byers and Johnston, 1940, p. 51 (Shellmound, unnamed); Ritchie, 1944, pp. 375, 381, 388 (Brewerton, Frontenac, Lamoka); Miller, 1941, p. 54 (Dubois); W. S. Webb, 1946, p. 275 (Indian Knoll); Webb and DeJarnette, 1942, pp. 197, 317 (Lauderdale); Lewis and Kneberg, 1947, p. 26 (Eva).

[75] Miller, 1941, p. 54, Pl. 15: 2–3 (Dubois); Cole and Deuel, 1937, Fig. 29: 20, 23 (Black Sands); Webb, W. S., 1946, pp. 273, 276–7 (Indian Knoll); Webb and DeJarnette, 1942, Pls. 220: 1, 294: 2 (Lauderdale); Ford and Quimby, 1945, p. 41 (Tchefuncte); Claflin, 1931, Pl. 31 (Savannah River); Lewis and Kneberg, 1947, p. 16 (Eva).

[76] Cf. Webb and DeJarnette, 1942, pp. 270–86, for discussion.

[77] Griffin, 1946, p. 59. Also, see above, Fn. 57.

[78] Illustrated in Lillard, Heizer, and Fenenga, 1939, Pl. 20, *b–e*.

[79] Gifford and Schenck, 1929, Pl. 19, *a–l*. Patterson (1937) illustrates eastern varieties.

[80] *Drilled teeth:* Ritchie, 1944, pp. 377, 384, 392 (Brewerton, Frontenac, Lamoka); Miller, 1941, p. 33 (Dubois); W. S. Webb, 1946, p. 303 (Indian Knoll); Webb and DeJarnette, 1942, p. 247, Pl. 289: 1 (Lauderdale); Ford and Quimby, 1945, p. 49 (Copell, Tchefuncte); Lewis and Kneberg, 1947, p. 28 (Eva). *Cut jaws:* W. S. Webb, 1946, p. 227 (Indian Knoll); Webb and DeJarnette, 1942, Pl. 151: 2 (Lauderdale); Lewis and Kneberg, 1947, p. 28 (Eva); Ford and Quimby, 1945, p. 42 (Tchefuncte).

[81] Compare, e.g., W. S. Webb, 1946, Pl. 45, *d*, and Hadlock, 1943, Fig. 34, with Pl. I, *left column*, this paper.

scribed above from the Early Horizon have identical parallels in skull cups, tubes, and daggers with the Indian Knoll site and shell mounds assigned to the Lauderdale and Eva foci. The only question concerning these implements, or the perforated human teeth from the same sites, is whether they really belong to the subsequent Adena level, to which such traits are attributed elsewhere; some occurrences were at considerable depth in the shell mounds.[82] The same sites have the closest parallels to the spatulate bone "hairpins" or "ear ornaments" of the Central California Early and Middle Horizons, although similar spatulate implements, with or without engraved decoration or modified ends, occur in the Dubois, Savannah River, Eva, and Fourche Maline (Oklahoma) cultural units.[83]

The last of the third group of elements common to Eastern sites and Central California, the tubular pipe, is shared also with the Basketmaker and Mogollon cultures of the Southwest. It seems confined to the southern part of the East, and is rare where it occurs, in the Lauderdale, Poverty Point, Tchefuncte, and Eva foci.[84] The southerly distribution of the early occurrences and other factors led Ford and Quimby,[85] among others, to favor its derivation from the south. Caribbean evidence is incomplete, yet tubular pipes have not yet been verified in any early context in the Middle American area. Although the failure to identify early occurrence in the supposed area of origin does not prove the supposition wrong, alternative sources at least become the more possible. If the tubular pipe is, as suggested here, correctly associated with the other elements common to the "Paleo-Indian" horizon of the eastern states and the West Coast, and if these all have common ancestorship, the tubular pipe could come from the same common source, which is not in the south.[86]

Archaeological traits of the third group, and possibly some of the first and second groups, appear to substantiate Haag's hypothesis of genetic relationship among early cultures in the various parts of the continent, although modifications of his list of parallels have been made, as well as additions. We may suppose that early migrants to North America brought variants of a common ancestral culture to form the base of West Coast, Northeastern, Southeastern, and probably Southwestern culture sequences. Further investigation may certify presence of the ancestral culture in the Plains and Cordilleran zones, unless these areas split the southward cultural drift into two parts.

But the California evidence requires formulation of a fourth group of traits: those which are absent from California but common to the easterly units of this "Paleo-Indian" horizon and to the northerly areas screening the presumable ancestral culture. These include heavy stone tools usable in woodworking, such as the ax, the adz, and the gouge. As Spaulding has shown,[87] these tools have relatives across North America and northern Eurasia as far as the Baltic, but they have no analogs in California except as they penetrate from a separate Northwest Coast pattern. Neither do slate implements, celts, gorgets, and other polished stone items familiar in the East occur in California. The reasons are unexplained but, whatever the factors, they may be parallel to those accounting for absence of pottery, which appears to have entered the continent from the north[88] as well as the south without being able to penetrate to the Pacific coast. These negative distributions will remain puzzling as long as so little is known of the Canadian areas across which the lines of cultural movement were drawn, but at least they suggest the occurrence of several pulses of migration or cultural dif-

[82] W. S. Webb, 1946, Pls. 26, *d*, 51, *b–c;* Webb and DeJarnette, 1942, p. 124, Pls. 129, *a*, 287, *b*, 298, *a;* Lewis and Kneberg, 1947, pp. 17, 29. Cf. Webb and Snow, 1945, p. 98, Trait 170, for Adena occurrences.

[83] W. S. Webb, 1946, Fig. 51, *a* (Indian Knoll); Webb and DeJarnette, 1942, pp. 88, 259, Pl. 287, *b* (Lauderdale); Miller, 1941, Pl. 11 (Dubois); Martin, Quimby, and Collier, 1946, p. 373 (Savannah River); Lewis and Kneberg, 1947, p. 27; Newkumet, 1940, *passim*.

[84] Webb and DeJarnette, 1942, pp. 42, 75–6 (Lauderdale); C. H. Webb, 1944, p. 387 (Poverty Point); Ford and Quimby 1945, p. 29 (Tchefuncte, of clay); Lewis and Kneberg, 1947, p. 26 (Eva).

[85] Ford and Quimby, 1945, pp. 30–1; dated as earliest in Burial Mound I period by Ford and Willey, 1941, p. 335.

[86] One aspect of the tubular pipe problem which has bearing on its source and probable direction of spread is the question of whether it was initially associated with tobacco smoking. Its ritual associations, use with plants other than tobacco, and occurrence in very early context make it conceivable that the tubular pipe began existence as the shaman's sucking or blowing tube. In the latter event, "pipes" might be considered to have been transferred to smoking use some time after their derivation from the boreal zone as shaman's equipment.

[87] Spaulding, 1946.

[88] McKern, 1938.

fusion across the North, the later ones using different routes from the earlier ones.

To summarize, it has been shown that California exhibits a series of significant culture changes which become increasingly well defined as more areas are explored. Though isolated to a degree from other parts of the continent its inhabitants were culturally akin not only to the peoples of nearby regions such as the Southwest, with whom they kept contact, but were akin also to the early post-Folsom-Yuma peoples of the eastern half of the United States. Future study of culture developments in California not only can expect assistance from the findings of these other areas, but in return may offer help in working out the lines and phases of culture spread and growth during the formative period for the continent as a whole.

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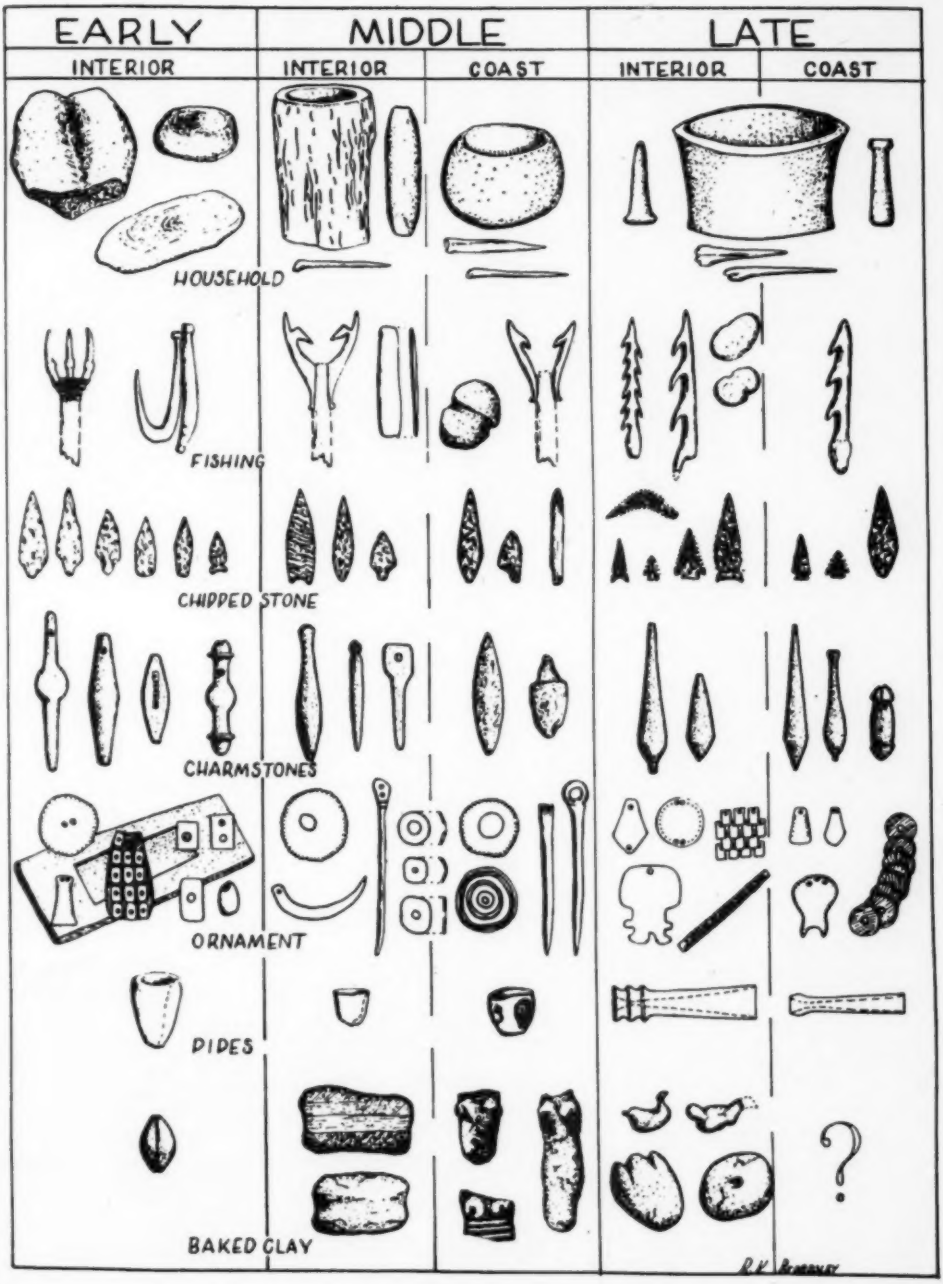
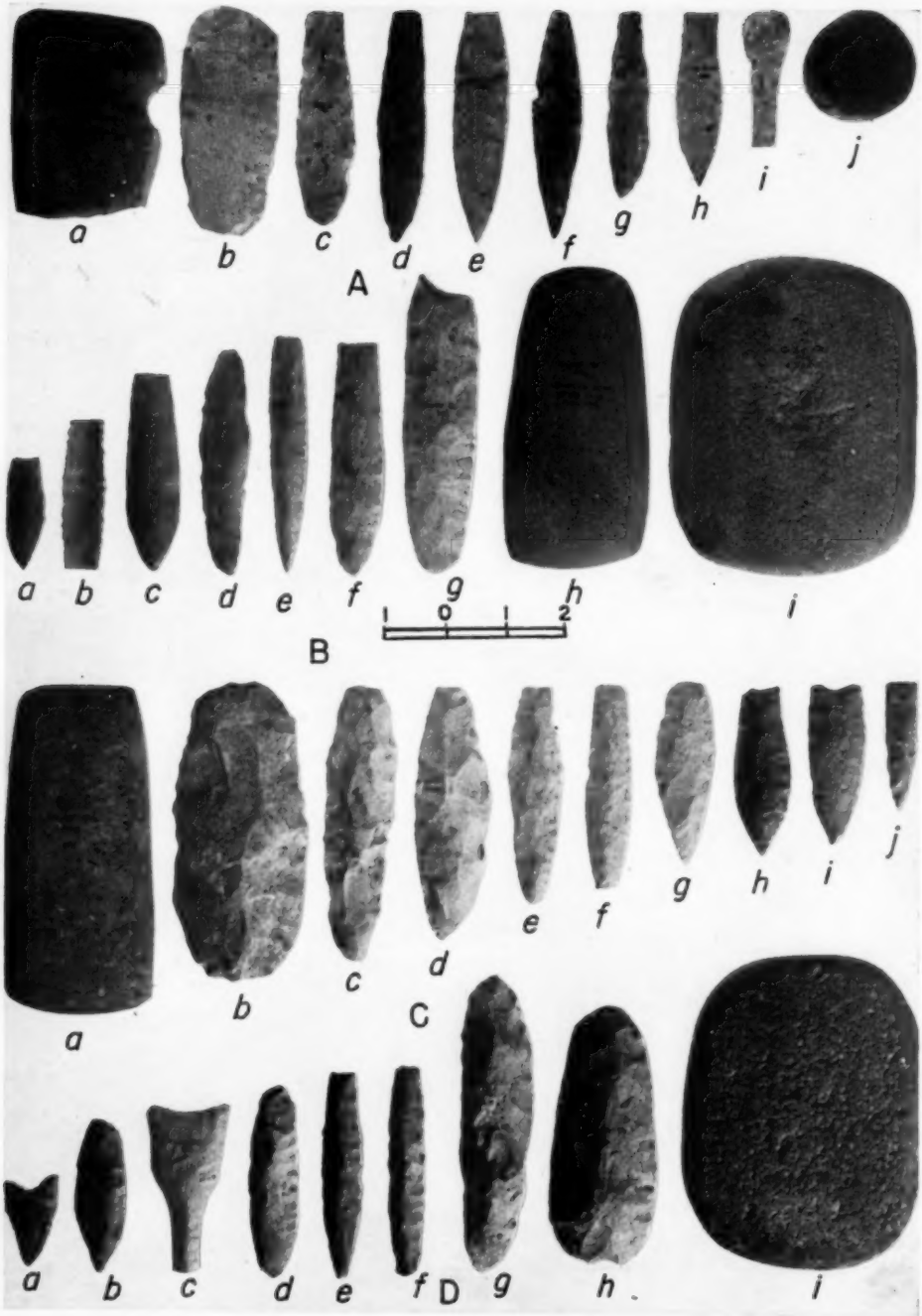
Department of Anthropology
University of Michigan
Ann Arbor, Michigan
January, 1948



Artifact types of the Early, Middle, and Late Horizons, Central California. Some link traits are shown for Coastal and Interior zones in Middle and Late Horizons.



Artifacts of the Nebo Hill complex from near Kansas City, Missouri. A, Site 23CL11; B, Site 23CL12; C, Site 23CL13; D, Site 23CL14. (Scale refers to inches.)

NEBO HILL, A LITHIC COMPLEX IN WESTERN MISSOURI

J. M. SHIPPEE

TWENTY-SIX years of periodic reconnaissance along the Missouri River bluffs in western Missouri have revealed numerous archaeological sites on which repeated finds of long well-made blades, lanceolate in form, have occurred. These typical blades are not found in the artifact inventories of the reported manifestations of the region, but do seem to bear striking similarities to artifacts of the lithic cultures of the Great Plains. Brief mention of this complex has appeared (Shippee, 1940, p. 12; Wedel, 1943, p. 102) but it has not been fully characterized. Data now available will be presented here; they are tentative until supplemented by excavation.

The four sites which will be described are located in Clay County, Missouri, within a few miles of Kansas City (Fig. 4), in which area the Kansas River joins the Missouri. The prairies of eastern Kansas are relatively close by. The topographical locations and artifact inventories of these sites are practically identical.

DESCRIPTION OF SITES

In general these sites of the Nebo Hill complex are 840 to 940 feet above sea level and 120 to 220 feet above the river flood plain. That the occupational areas of this complex are consistently located on bluffs and hills seems of particular significance and more especially since these topographic features were covered by a climax hardwood forest until historic times.

23CL11

The type site, located on Nebo Hill, has been given the designation 23CL11.[1] Nebo Hill rises abruptly 220 feet above the Missouri River flood plain, dominating the surrounding landscape. It has only the scattered remnants of a hardwood forest upon it today. In fields washed and gullied until the plow cuts into the underlying loess, the distinctive blades and other artifacts of this complex are found. Concentrations of stone flakes occur at intervals over the more level portions of this large site, and these areas and the washed slopes adjacent to them seem to produce most of the specimens.

23CL12

Site 23CL12 occupies a lower ridge about half a mile distant from 23CL11. This ridge has an average height of some 140 feet above the river flood plain. As at 23CL11, erosion has scarred the fields and slopes and extensive trenching will be needed to determine how much of the site remains with artifacts *in situ*. On the terraces of two small spring-fed streams adjacent to this hill-top site, there are the remains of villages of Hopewellian and Middle-Mississippian complexes (Wedel, 1943). A few corner-

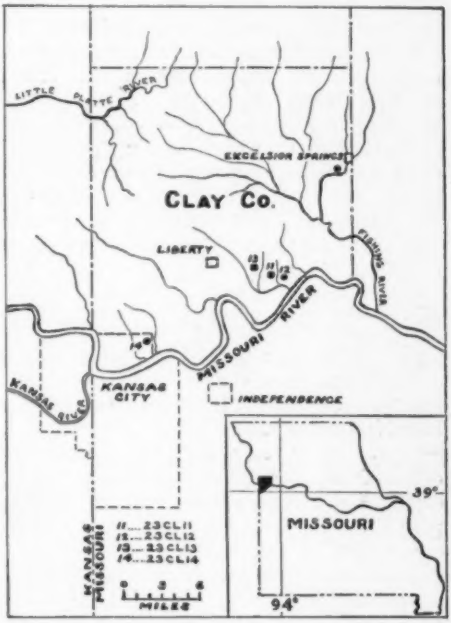


FIG. 4. Map of Clay County, Missouri, showing five sites of the Nebo Hill complex, four of which are described in this paper. Inset gives the location of Clay County.

[1] This site designation follows the usage adopted by the Missouri River Project of the River Basin Surveys. Twenty-three is the code number for the state of Missouri, CL for Clay County, and 11 is the site number.

notched points, common on Hopewellian sites in this area, have been found upon 23CL12, but only one small grit-tempered sherd has been found in sixteen years of observation. As may be expected in such rough terrain, the artifacts from this high site do tend to work downward to the gullies and creeks, but the greater portion of them can be readily distinguished from those of the lower sites.

23CL13

Site 23CL13 is about 2 miles from 23CL11 and on a less conspicuous ridge. The site lies 120 feet above the Missouri River flood plain and nearly 2 miles north of the river valley. Several sites located on the terraces of a nearby creek are tentatively identified as Woodland. The long gradual slope to 23CL13 does not seem to cause the severe erosion that is so noticeable on the high bluffs along the river. A large part of this site is littered with flakes, spalls, and broken blades, the residue of flint-working that utilized a local outcropping of chert nodules and blocks. The artifact inventory of 23CL13 does not include any items believed to be aberrant. The more finely chipped blades seem to be found less frequently here.

23CL14

Site 23CL14 is situated on a generally high area 130 feet above the river flood plain and a mile and a half from it on the west side of a broad creek valley. This site has been under observation for 32 years. My home occupies part of it and the residential area of Kansas City has expanded so that houses now occupy the central part of the site and it is lost to archaeological exploration. Thick bowl-shaped mortars of quartzite have been found here, and other artifacts from 23CL14 which have not been found on other sites are two hoe-like objects of flaked chert having polished bits (Pl. II, D, *h*) and two re-worked and serrated points with concave bases (Pl. II, D, *a*). This site has produced several stemmed points, and, on a portion that is quite level, a small thick gravel-tempered potsherd was found on the surface when the tract was in cultivation. In the valley below, there are small camps on which a few such pottery sherds have been found. Tests on this site have revealed flakes, spalls, and a few artifacts scattered through the soil to a depth of 14 inches. One of these tests was in a woods-pasture never turned by the plow.

DESCRIPTION OF ARTIFACT COMPLEX

On all sites, evidence of considerable stone flaking is observed; the material used is a chert found locally. This chert, rather poor in quality, ranges in color from white to buff with an occasional shade of grey or pink. The characteristic chipped artifacts of this complex, regardless of where we have found them, are made almost exclusively of this chert. Materials for the artifacts of ground stone found on these sites and the abraders of sandstone and scoria are obtainable in the vicinity. Pebbles from glacial drift are exposed by the streams; sandstone outcrops several miles to the northwest; and scoria is found on sandbars and driftwood of the Missouri River. Bone artifacts and refuse have not been found, and the limited testing has not revealed middens, pits, hearths, or evidence of dwellings.

Chipped Artifacts

The most characteristic artifacts are the finely chipped blades of lanceolate form, with a squared or convex base (Pl. II, A, *d*, *e*; B, *e*; C, *e*, *f*; D, *e*). They are 70 to 160 mm. long; the width is one-sixth of the length and the cross section is lenticular to elliptical in shape. Flaking is irregular over the surfaces with secondary chipping common on the finer pieces. Concave bases (Pl. II, B, *a*; C, *h*, *i*) are quite common, and double-pointed types occur as well (Pl. II, A, *f*). Some of the broad-pointed blades (Pl. II, A, *c*, *h*; B, *c*, *f*) seem to have been re-sharpened from the most characteristic form. Other blades have been made or modified into strong drill-like tools (Pl. II, A, *g*; B, *d*). Serration (Pl. II, B, *b*) is not a common trait and basal thinning and grinding are quite rare. Scrapers are represented by a few roughly shaped plano-convex specimens with or without secondary chipping on adaptable edges. Expanded base drills (Pl. II, A, *i*; D, *c*) and slender drills with parallel sides (Pl. II, D, *f*) occur. The latter range from 30 to 100 mm. in length.

Several types of Nebo Hill blades and points suggest affinities between this complex and previously reported lithic cultures. One type (Pl. II, C, *i*), for example, is very similar to the concave base types from Signal Butte I (Strong, 1935, Pl. 29, Fig. O). Another (Pl. II, C, *h*) seems very much like a Plainview point (Sellards, *et al.*, 1947, Pl. 5: 1–1A). Any attempt to date this material, however, must await actual excavation and a careful examination of this region by a qualified student of land forms.

Ground Stone

Flat celts (Pl. II, B, *h;* C, *a*) are typical of these sites, and three-quarter-grooved axes (Pl. II, A, *a*) are present on all of them. These two items are evidence of a high degree of skill in the grinding of stone. Smoothed and striated pieces of hematite occur, and one flat celt has been observed which had been flaked from hematite and then ground smooth on the bit. Flat oval manos (Pl. II, B, *i;* D, *i*) and rounded hammerstones (Pl. II, A, *j*) are found on all sites.

ARTIFACT INVENTORY

Table 5 presents an artifact inventory from the surface of four sites of the Nebo Hill complex. (X indicates occurrence, o absence.)

Table 5. Artifact Inventory of Nebo Hill Complex

	References, Plate II	*Site 23CL11*	*Site 23CL12*	*Site 23CL13*	*Site 23CL14*	*Total*
Bow-shaped stone mortars	—	o	o	o	x	1
Flat oval manos	B, *i;* D, *i*	x	x	x	x	4
Rounded hammerstones	A, *j*	x	x	x	x	4
Three-quarter-grooved axes (ground or polished)	A, *a*	x	x	x	x	4
Flat ground stone celts	B, *h;* C, *a*	x	x	x	o	3
Flat chipped hematite celt	—	x	o	o	o	1
Ground and striated hematites	—	x	x	x	o	3
Large rough blades	A, *b;* B, *g;* C, *b;* D, *g*	x	x	x	x	4
Chipped spades or hoes (polished)	D, *h*	o	o	o	x	1
Lanceolate blades (typical)	A, *e;* B, *e;* C, *f;* D, *e*	x	x	x	x	4
Re-worked blades	A, *c, h;* B, *c, f*	x	x	x	x	4
Double-pointed blades	A, *f*	x	x	x	x	4
Serrated blades	B, *b*	x	x	o	x	3
Expanded-base drills	A, *i;* D, *c*	x	x	o	x	3
Parallel-sided drills	D, *f*	x	x	o	x	3
Notched or stemmed points (intrusive?)	—	x	x	o	x	3
Pottery sherds (intrusive?)	—	o	x	o	x	2
Scrapers	—	x	o	x	o	2

GEOGRAPHICAL DISTRIBUTION

The data on the geographical distribution of the Nebo Hill complex are extremely limited, but there are a few clues to its possible spatial extent. Other sites in the Kansas City area on which typical Nebo Hill blades occur have not been examined thoroughly and therefore were not included in this report. It appears that stemmed or notched blades and points will predominate at some of these sites, but the chronological sequence of these artifact types is not yet determined. No pottery has been reported from these sites.

Typical Nebo Hill blades may be identified in photographs of material from sites in southern Saline County, Missouri,[2] and similar material is reported from a series of small sites on the bluffs along the Missouri River in Carroll County, Missouri. An indication of the possible western extent is the presence of typical Nebo Hill blades in the collection of the late Charles Kinsey of North Kansas City; these are said to have been found on a hilltop near Manhattan, Kansas. There have been several reports of material believed to resemble Nebo Hill blades from Iowa archaeologists, and, during the writing of this paper, a number of typical specimens were seen in the collection of Paul R. Rowe, Glenwood, Iowa.[3] This material is reported from several sites on the bluffs near Glenwood, almost directly opposite the mouth of the Platte River in Nebraska.

[2] I am indebted to Carl Chapman, University of Missouri, for these photographs and the accompanying data, which were furnished him by H. F. Nelson of Sweet Springs, Missouri and J. J. McKinny of DeWitt, Missouri, December 5, 1947.

[3] Personal communication, John L. Champe, Lincoln, Nebraska, January 19, 1948.

SUMMARY AND CONCLUSION

This report is based upon observation of archaeological sites and surface material exposed in old fields on the loess bluffs along the Kansas City sector of the Missouri River. Several hundred artifacts have been observed from sites located in two counties in western Missouri. Four sites have been chosen for this study, and these sites have almost identical artifact inventories as well as similar highland locations. Limited testing has revealed scattered material underground, extending, in some cases, lower than the plow line. Pottery is lacking but diagnostic artifacts, such as lanceolate blades, are reminiscent of material reported from Signal Butte I and Plainview, Texas. The known geographical extent of this complex is confined to several counties along the Missouri River in central and western Missouri and in an area near the same river in southwestern Iowa. One site has been reported near Manhattan, Kansas.

The four sites described here and others with the same characteristic location and artifact inventory are believed to be the occupational areas of a hithertofore unreported complex, affiliated perhaps with preceramic cultures of the Great Plains. It seems appropriate to call this series of manifestations the Nebo Hill complex.

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THE GALLINA ARCHITECTURAL FORMS

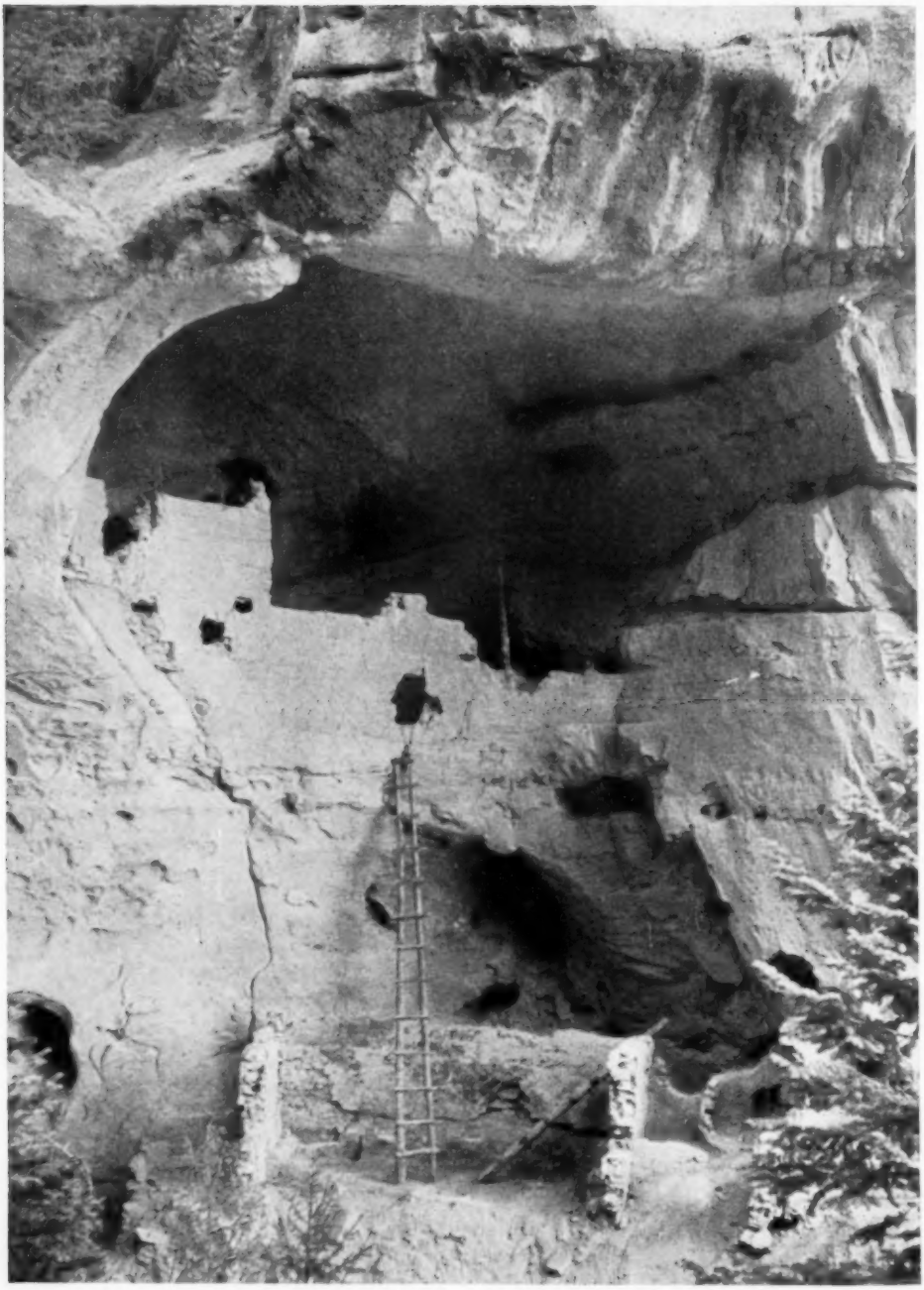
FRANK C. HIBBEN

IN 1932 and 1933 the Laboratory of Anthropology and the University of New Mexico started independently on research projects which involved certain provocative cultural manifestations in north central New Mexico. Dr. H. P. Mera published the results of his investigations in 1938 under the title, "Some Aspects of the Largo Cultural Phase, Northern New Mexico."[1] In the same year, the author reported on some preliminary work in the same area in an article entitled "The Gallina Phase."[2] As the university has continued its work in the more easterly section of this area, the name "Gallina" is retained in this connection, although the two types of material are obviously referable to the same cultural horizon.

In the excavating seasons just prior to the war, sporadic excavations were carried on in this area and a survey of the whole cultural province was continued. Excavation of two Gallina sites was accomplished under the direction of Mr. Charles Lange and Mr. Ernst Blumenthal, both former graduate students working on special projects at the University of New Mexico. Mr. Blumenthal and Mr. Carrol Burroughs assisted in the excavation of an important surface site called "Cuchillo" in the Gallina Valley and in the work on a cliff-cave site in Nogales Canyon in the same area. The hard work and conclusions of all of these workers have been drawn upon for this sum-

[1] Mera, 1938.
[2] Hibben, 1938.

Gallina sites in north central New Mexico. *Upper left*, debris of main tower at Rattlesnake Point. *Upper right*, remains of a unit house on Rattlesnake Ridge. *Lower left*, interior of tower at Rattlesnake Point. *Lower right*, tower remains on Nogales Ridge.



Cliff house in Nogales Canyon, New Mexico.

mary, and their help and compliance is gratefully acknowledged.

In August and September of 1947 a special excavation was initiated in the Gallina area in an attempt to answer some of the pressing questions which had been posed by the earlier work. This was especially true of architectural remains which occur in a number of variations and whose exact form and relationship have been obscure. A site was chosen at Rattlesnake Point, which is six miles north of the small post office of Llaves, New Mexico. This site seemed to contain, from surface indications, all of the features of the Gallina in one group, and their relationship might thus be established. Also the Rattlesnake Point group is accessible because of the completion of a new road to the dam at El Vado. Accessibility and a source of potable water are two features for which the Gallina area is not famous.

It has become evident that several varieties of sites occur in the Gallina area. There are individual house units of stone masonry, which are found alone and in groups. These were first remarked by Douglass[3] and given the name, "single houses." There are pit house villages such as those which occur on the north foothills of the San Pedro Range near the point where the Gallina stream issues from the mountains. In addition to the foregoing there are pueblo-like structures or groups of unit houses such as that on Gallina Mesa, and there are architectural remains in caves which present variations of Gallina structures. Lastly stone masonry tower structures are typical and occur singly and in groups from the San Pedro Mountain massif to the Colorado line and for an unknown distance northwestward.

Previous surveys in limited areas of the Gallina province had already indicated that these architectural forms occur together in all combinations. Thus the Cerrito group which was partially excavated in 1938 contained five unit houses, a tower, and a pit house. The Cuchillo group contained a single unit house and one pit house. Numerous other unnamed groups on French Mesa, Dead Man's Mesa, and in the Largo area contain all combinations of unit houses, pit houses, and towers. Also in these areas, the latter three forms occur singly at distances of a hundred yards to a mile or more from other Gallina remains. The pueblo-like structures which are apparently, from surface sherds, a part of the Gallina problem, are much less frequent. Only two of these are known and these may prove upon excavation to be clusters of unit houses grouped unusually close together. The cliff house structures appear to be unit houses or towers built in a cave shelter position. Nogales Cliff House, near the town of Llaves, has been excavated by the University of New Mexico; typical tower and unit structures were found clustered together in a cave. Architectural forms and cultural remains were the same as in the rest of the more usual Gallina sites. Six such Gallina cliff shelter sites are known and many more doubtless exist.

In all of this heterogeneous series of architectural forms, the accompanying material culture is of a constant nature. The decorated pottery which has been designated by Mera[4] as diagnostic of the phase is present in towers, unit houses, and pit houses. The pointed bottom utility wares that have caused so much comment occur throughout. In the two pit houses excavated previously, there was some indication that plain pottery of the pointed base type occurred in a higher percentage, but this seemed inconclusive. Gallina axes are of the base-notched variety. Knives, tobacco pipes, arrow shaft straighteners, and arrow heads are distinctive and may usually be recognized out of context. The bone and antler work of this area is especially distinctive. The series of elk and deer antler adzes from these remains is quite different from Pueblo articles of the same type and implements of bone and antler are far more numerous than in Rio Grande sites.

The Rattlesnake Point group contains, from surface indications, two pit houses, a unit house, and a tower (Fig. 5). In addition, there are two reservoirs, a feature which renders this site unusual. In the last season's excavation, only the interior of the tower was cleared. This tower structure, however, added considerably to the knowledge of Gallina architecture and furnished some very conclusive tree ring dates (Fig. 6). Based on this recent work the architectural forms of this area are as follows:

1. UNIT HOUSES

Location:

a) Low, river terrace situations.

b) Cliff edge, ridge top, defensible locations.

Form:

a) Rectangular.

b) Round or with rounded corners.

[3] Douglass, 1917.

[4] Mera, 1935, pp. 8–11.

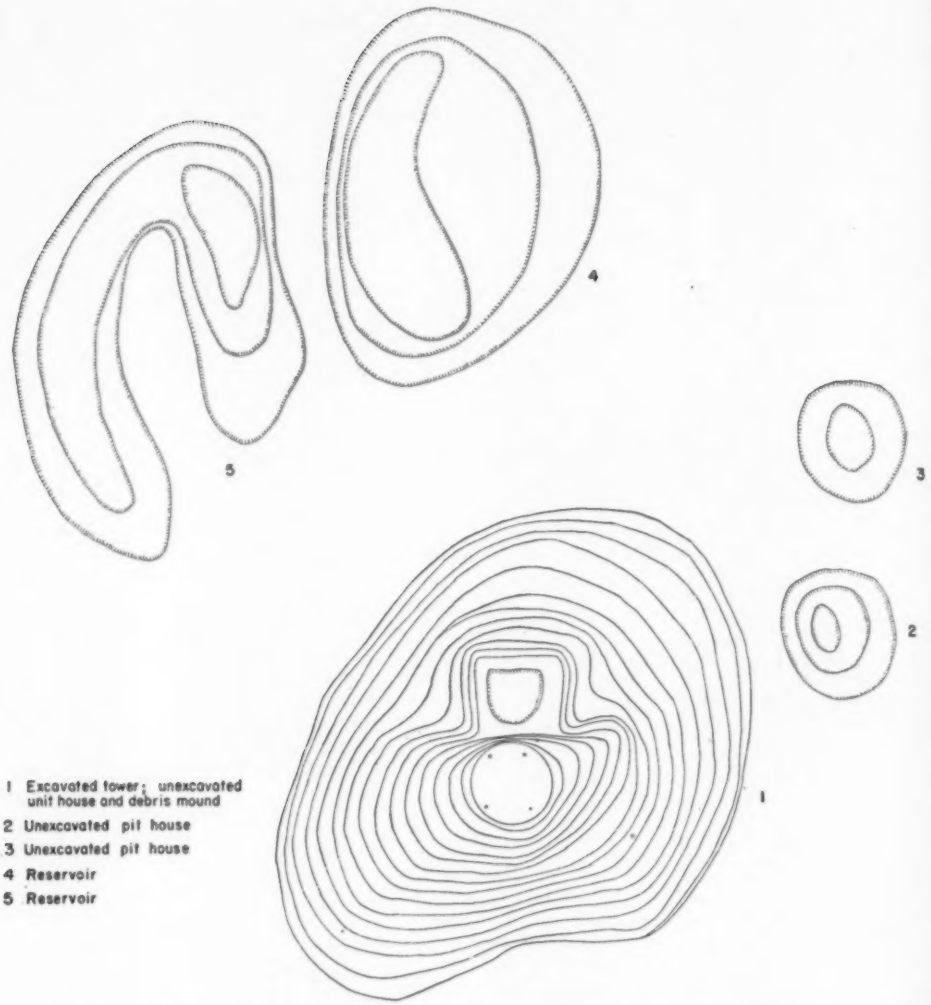


FIG. 5. Plan of Rattlesnake Point group, showing tower, unit house, pit houses, and reservoirs.

Size: Fifteen to 25 feet in greatest horizontal dimension. Approximately 8 feet in height.
Construction: Double wall of large, roughly shaped stone blocks and slabs; rubble fill between double walls.
Interior features: Ventilating shaft in thickness of wall, fire pit, and fire screen all oriented south.
Bins on south wall protruding from east and west walls.
Flagged floor.
Wall murals occasionally.
Occasionally additional bins on north side.
Occasionally subfloor cists.
Surface indications: Rectangular mounds of rock debris three to four feet high (Pl. III, *upper right*).
Building dates: 1240–41 (Stallings), 1253–54 (Mera).[5]

II. PIT HOUSES

Location:
a) In "villages" on river terraces or low promontories.
b) On high saddles and ridges where dirt cover is sufficient.

[5] Mera, 1935.

Form: Circular-subterranean.
Size: Fifteen to 25 feet in greatest dimension. (There are surface indications of pit houses 50 feet or more in diameter.)
Seven to 9 feet in depth.
Construction: Excavated, plastered walls, otherwise unlined.
Interior features: Ventilating shaft in thickness of wall, fire pit, and fire screen all oriented south.
Bins on south side protruding from east and west walls.
Flagged floor.
Surface indications: Circular, saucer-shaped depressions.
Building dates: 750+x (Hawley), 761+x (Hawley), 1106 (Mera).[5]

Occasional additional bins on north side.
Occasional banquette.
Surface indications: Mound of rock debris 12 to 17 feet in height; masonry protrudes from debris where upper walls have fallen away from base (Pl. III, *upper left*).
Building dates:
a) Square tower: 1240–41 (Stallings).
b) Round tower: 1085 (O'Bryan), 1085 (O'Bryan), 1087 (O'Bryan), 1087 (O'Bryan), 1087 (O'Bryan), 1092 (O'Bryan).

IV. PUEBLO-LIKE STRUCTURES

Location: On flat mesa tops.
Form: Contiguous "rooms."

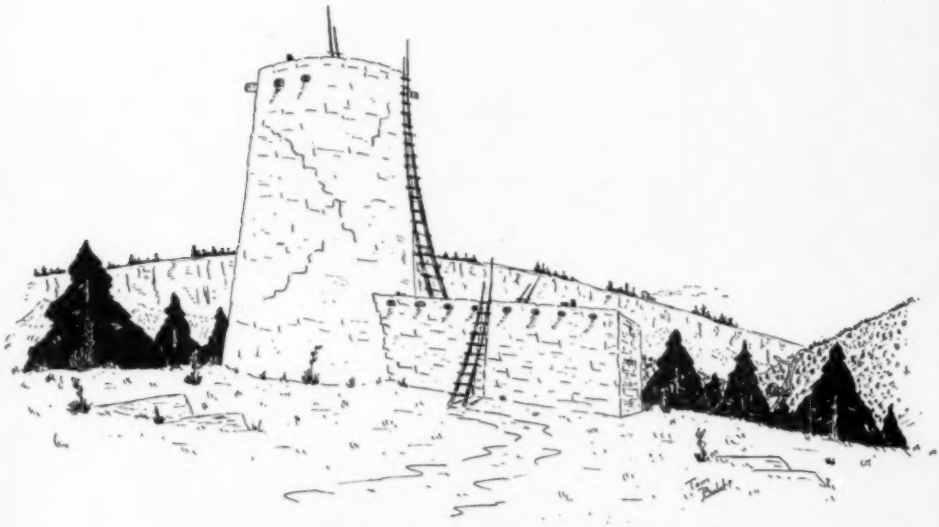


FIG. 6. Reconstruction of Rattlesnake Point tower and unit house.

III. TOWERS

Location: On cliff edges, sharp ridges, and other defensive situations (Pl. III, *lower right*).
Form:
a) Rectangular.
b) Circular.
Size: Fifteen to 26 feet in greatest horizontal dimension.
Twenty-five to 30 feet in height (based upon cubic content of fallen wall masonry calculated upon thickness of wall).
Construction: Double wall of large, roughly shaped stone blocks and slabs; rubble fill between double walls.
Interior features: Ventilating shaft in thickness of wall, fire pit, and fire screen all oriented south.
Bins on south side protruding from east and west walls (Pl. III, *lower left*).
Flagged floor.
Occasional wall murals.

Size: Sixteen to 20 "rooms."
Construction: Thick walls of heavy rock masonry. Most are double walls.
Interior features: Ventilating shaft, fire pit, and fire screen oriented south.
Bins from east and west walls.
(These data are from two pot-hunted sites; no excavation of a "pueblo" Gallina site has as yet been undertaken.)
Surface indications: Mound of stone masonry 4 to 6 feet high with depressions and ridges indicating several contiguous "rooms."
Building dates: None.

V. CLIFF HOUSES

Location: Beneath overhanging ledges and in caves.
Forms: Towers and unit houses identical with surface sites.
Size: From two unit structures to seventeen unit clusters.

Construction: Of adobe and lighter materials than surface sites. Single thickness walls.
Interior features: Ventilating shaft, fire pit, and screen all oriented south no matter what the orientation of the cave.
Bins on south side protruding from east and west walls.
Flagged floor.
Occasionally wall murals.
Surface indications: Well preserved ruins in canyon walls hidden and difficult of access (Pl. IV).
Building dates: 1239 (Haury-Scantling), 1256 (Haury-Scantling), 1259 (Haury-Scantling), 1264 (Haury-Scantling), 1266 (Haury-Scantling), 1267 (Haury-Scantling).

The dates so far connected with the various architectural forms give little clue as to precedence of one type of building over any other. Excavation evidence corroborates the contemporaneity of the different Gallina house forms. The towers may have been added to each area for purely defensive reasons. The cliff house locations also may be rated as military variations on basic Gallina forms. The pit houses and surface unit houses, however, present a duality of architectural tradition difficult to reconcile.

It is to be hoped that the work contemplated for 1948 will give a scattering of dates which will assist in clarifying the sequence of architectural forms of the Gallina. There are also a host of other pressing questions as to the cultural connections of this complex, which demand more study.

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Department of Anthropology
University of New Mexico
Albuquerque, New Mexico
February, 1948

CULTURE DYNAMICS IN EASTERN MASSACHUSETTS

RIPLEY P. BULLEN

SUFFICIENT work has been done in eastern Massachusetts to permit the formulation of working hypotheses regarding temporal changes in certain traits of the material culture of the aborigines. While the present data seem to show reliable trends, modifications in interpretation will undoubtedly be necessary upon additional excavation.

The chronological framework of the scheme presented here has been built on the basis of variations in shape of the projectile points found in various stratigraphic zones in the ground. Although the number of specimens from any one zone of a site is small, repetition of the phenomena is significant. Larger artifacts have been used when available to supplement and check the chronology based upon projectile points. Unfortunately, such major artifacts are extremely rare. Pottery has been correlated with projectile points by formulating ceramic periods. The author alone is responsible for classification of specimens and for any conclusions and suggestions presented.

Projectile point "types" and pottery "wares," as used in this paper, are fairly broad designations within which a considerable range of variation is permitted as explained below. Like all classificatory arrangements, this one is more or less arbitrary. Certain characteristics, which seem to have diagnostic value from the standpoint of chronology, have been singled out in forming the groupings or "types." Future work, subdividing some types into smaller significant units, may be desirable when sufficient additional data are available. There are at present suggestions that such work might be fruitful.

It is the intent of this paper to present only the broad outlines of the prehistory of eastern Massachusetts. Certain traits, such as knives, drills, types of hammerstones, etc., have been omitted from consideration. In some cases this has been done because information from different sites is not in convenient form for a comparison of such traits. In other cases such traits seem to be too generalized to have diagnostic value or are limited to only one site.

TYPES OF PROJECTILE POINTS

For the purposes of this paper, ten types of projectile points are recognized. These are illustrated, named, and some idea of their range of variation is shown in Figure 7. Examination of this illustration will indicate that size is an important consideration in several cases. Several other types of points, also found in eastern Massachusetts, have not been included as their significance is not at present evident.

Large triangular points are usually greater than 3 cm. in size and equilateral, but sometimes isosceles, in shape. While sides may be excurvate or incurvate, the tendency is for them to be straight. These points have sharp basal corners and usually a slight to medium concavity of base.

Small triangular points, on the other hand, are less than 3 cm. in length and relatively broad. Predominantly, they have excurvate sides and rounded, incurving basal corners. Usually the base is a little concave but sometimes it is slightly convex or extremely concave.

A small lanceolate form of point is included among the small triangular points. This form was originally considered to be a variation of the small triangular. It may prove to be a relatively early, separate type.

Large lanceolate points are characterized by excurvate sides and only slightly concave bases. The maximum width is at approximately one-third of the distance from the base to the tip. In length these points vary from 3.5 to 6.5 cm.

Corner notched points may be short and broad or long and relatively narrow. Notches are narrow, about 5 mm. in width, and obliquely chipped. The base is nearly as wide as the maximum width of blade and frequently blunted at its extremities. In the shorter, broader form there is occasionally a pronounced angle in the sides of the blade which tends to give these points an over-all pentagonal appearance. Longer forms have excurvate blades. The last point illustrated for this type has notches which are horizontally, not obliquely, chipped. However, location and narrowness of notch, type of base, method of chipping, kind of material, and stratigraphic provenience indicate it should be classed with corner notched points.

Side notched points have nearly straight-sided blades, wide notches, and nearly straight bases. The latter tend to have sharp basal corners. Notches are twice as wide, about 1 cm., and not obliquely chipped as are those of corner notched points. The term "side-notched point" is limited in this paper to the two forms illustrated. There are other types of side-notched points found in eastern Massachusetts which do *not* have the same implications of chronology that I attribute to the illustrated forms.

Small stemmed points are usually 2 to 3.5 cm. in length but are sometimes found as long as 5 cm. There is a considerable variation in the modification of these points for hafting, from those having a well-made tang to those with only a suggestion of a basal constriction. Stems are more than half as wide as blades. Various subtypes of small stemmed points are shown in the illustration (Fig. 7).

Corner removed points differ from small stemmed points both in gross size and width of tang. The whole corner, instead of part of it, has been removed, leaving a tang less than half as wide as the maximum width of the blade. In the shorter, wider variety, there is a tendency for the corners of the blade to be barbed. Sometimes the bottom of the tang is rounded or curved. In the larger, heavier variety, the angle between the side of the tang and the lower part of the blade approaches a right angle. Sometimes the side of the tang, between the corner of the base and the corner of the blade, consists of a continuous concave edge.

Straight stemmed, straight base, and pointed base points are all relatively long, narrow, and heavy (thick). Tangs of straight stemmed points are but slightly narrower than blades and have straight parallel sides and a straight base. The lower portions of straight base points have straight sides which are parallel or converge slightly towards the base which is straight across. Sides of tangs of pointed base points are slightly concave while the point of the tang is rounded or curved.

In eastern Massachusetts there is an ex-

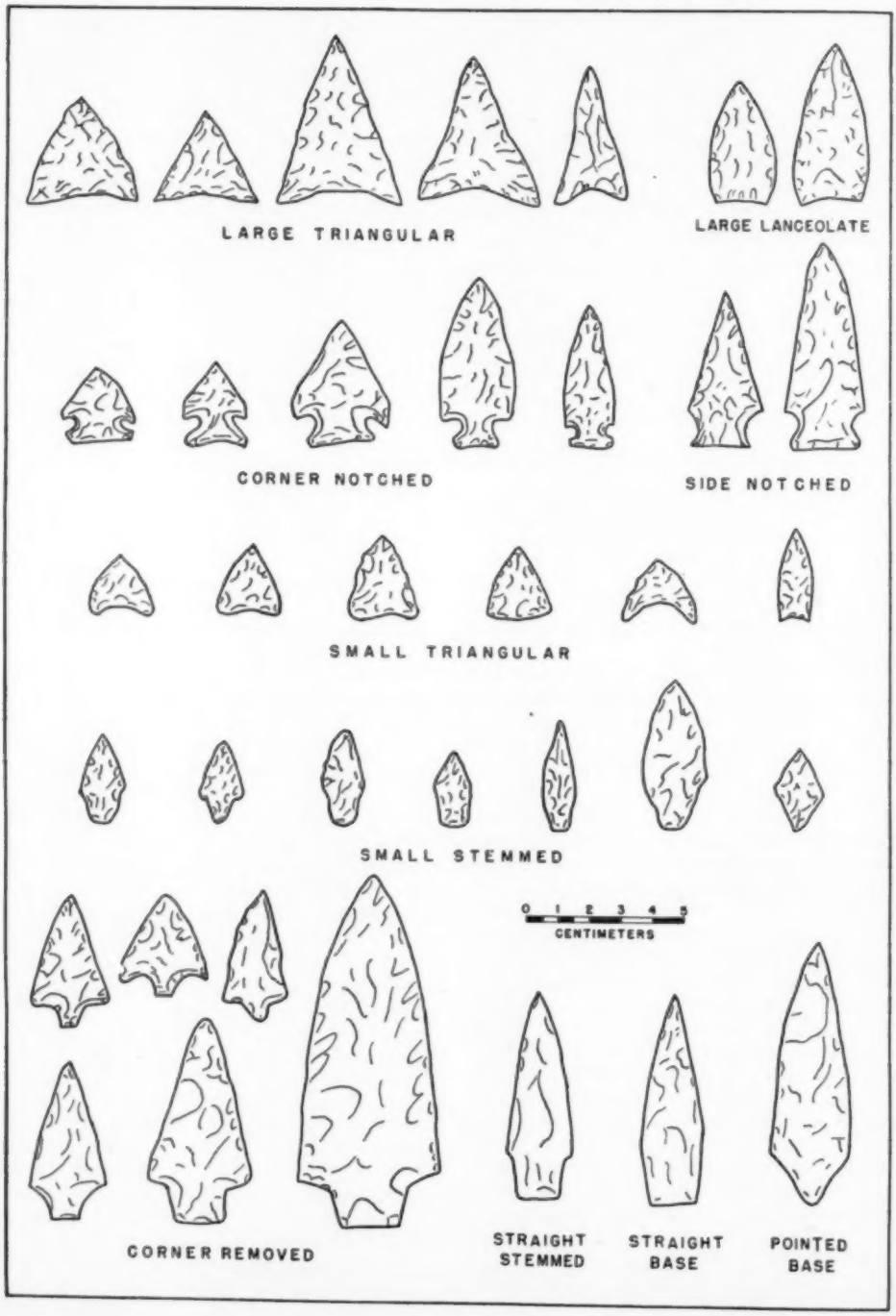

FIG. 7. Projectile point types from eastern Massachusetts.

tremely high correlation between the type of point and the material from which it is made. Large triangular, large lanceolate, and corner-notched points are predominantly made of dark felsite exhibiting little if any patination. The last named points are sometimes made of chert (jasper). Small triangular and small stemmed points are made chiefly of quartz. When made of felsite, they are moderately patinated, as are side-notched points which are made of this material. Corner-removed, straight stemmed, straight base, and pointed base points are usually made of felsite although sometimes of gray slate. Both materials are substantially, sometimes extremely, patinated. Occasionally these points are made of quartzite, very rarely of quartz.

CLASSES OF POTTERY

Pottery of eastern Massachusetts has been divided into four major classes which seem to have chronological significance. These will be designated Early or Vinette Type 1, Intermediate, Late Prehistoric, and Historic. Several wares are included in some of these classes. Late Prehistoric pottery is sometimes found in association with items of European manufacture.

The earliest pottery in the area is thick, averaging 1 cm.; abundantly tempered with coarsely ground quartz or granite; and frequently having a reddish hue. Vessels are constructed by coiling, have pointed bottoms, straight or excurvate sides, and predominantly rounded rims. Both inner and outer surfaces are cord-malleated. This pottery will be called "Vinette Type 1" as it has been so named by Ritchie.[1] It appears to be the earliest pottery in both west central New York and eastern Massachusetts. That it may also be the earliest in Connecticut is suggested by its stratigraphic position in that state.[2]

Intermediate pottery has been divided into two wares. Early Intermediate sherds are medium thick, averaging 7–8 mm., medium coarse mineral- (occasionally shell-) tempered; and tan to gray in color. Vessels are coiled, have pointed bottoms, straight sides with sometimes a suggestion of neck constriction, and rounded but sometimes flattened rims. Occasionally, rims are notched. Decoration consists of cord-malleations (exterior surfaces only), rocker, scallop shell, and dentate impressions, jabbed imprints, and dashed or trailed lines made with various tools. This decoration, except in the case of cord-malleations, is usually limited to the upper part of the vessel.

Late Intermediate pottery is similar to the above but is usually shell- (sometimes vegetable- or mineral-) tempered. It usually has a definite but slight constriction of the neck. Rims are nearly always flattened and wider than walls. Sometimes this flat rim has been pulled or pinched outward until it is about twice as wide as the wall. Frequently the inner surface of this ware is channeled. This pottery may be undecorated or have a roughened or furrowed exterior. Commonly it is decorated on shoulder, neck, and rim with imprints made with a cord-wound stick. These imprints may be arranged in panels. Individual cord impressions are not close together.[3]

Late Prehistoric pottery includes three wares. The first or Late Prehistoric 1 is known only from rim sherds, which apparently do not indicate a constricted neck. Sherds are reasonably thin, averaging 5 mm.; tempered with finely crushed rock or shell; and brownish in color. Rims are rounded. Decoration consists of imprints of cord-wrapped sticks in which individual cord marks are close together. Designs, which include triangles, diamonds, and platted areas, are found on the sides below the rims.[4]

Late Prehistoric 2 ware is medium thin, averaging 5–6 mm.; shell-tempered; and black, gray-brown, or tan in color. Sherds have a laminated structure, and vessels were not, apparently, made by coiling. Usually they have a constricted neck; flaring, everted rim; and a semi-globular body. The exterior surfaces of these vessels are covered with impressions of fabric- or cord-wrapped paddles over which shallow lines have been incised at the neck. Occasionally, paddle marks are partially smoothed over. Incision consists of straight lines parallel to the rim, multiple straight lines (usually three in number) which form a triangular or connected "V" design, or a combination of these motifs.[5]

Late Prehistoric 3 ware consists of thin, 3 mm. thick, small, globular-shaped vessels with

[1] Ritchie, 1944, p. 164; 1946, p. 13. For illustration of this pottery see Bullen and Hofmann, 1944, Pl. XVII, F and G.

[2] Rouse, 1947.

[3] For illustrations see Bullen and Hofmann, 1944, Pl. XVII, A–D; Bullen and Burtt, 1947, Fig. 5.

[4] For illustrations see Bullen, 1946*a*, Fig. 12, A; Torrey, 1946, Fig. 26, A; Moffett, 1946*a*, Fig. 5, 70.

[5] For illustrations see Moffett, 1946*a*, Fig. 5: 39 and 43.

SITES		PROJECTILE POINTS										OTHER ARTIFACTS						POTTERY X-MAJOR AM'T S-MINOR AM'T					COMMENTS
		TOTALS	CORNER-REMOVED	STRAIGHT STEMMED	STRAIGHT BASE	POINTED BASE	SMALL STEMMED	SMALL TRIANGULAR	SIDE-NOTCHED	CORNER-NOTCHED	LARGE TRIANGULAR	LARGE LANCEOLATE	OTHERS	SEMI-LUNAR KNIFE	CHOPPER	GOUGE	PESTLE	STEATITE SHERDS	GRAPHITE	CELT	PIPE	VINETTE TYPE I	EARLY IN-TERMEDIATE	LATE IN-TERMEDIATE	LATE PRE-HISTORIC 1	LATE PRE-HISTORIC 2	LATE PRE-HISTORIC 3	HISTORIC	
MAUD EATON, TEST III, UPPER		7							1	4	2								1					X	S			X	GUN FLINTS AND BRASS ARROW
FOSTER'S COVE, UPPER		40	2				2	5	3	27	1							X	2	X	1				X	S			TWO CHINA (ENGLISH?) FLINT GUN FLINTS, MUSKET BALLS IN UPPER PART THIS ZONE
SETH'S SWAMP, UPPER	COD	96	2					27		67								X		X	1								
PEAKED HILL, UPPER		7								7																			ALL SHELL-TEMPERED
CLIFF SHELL HEAP, UPPER	CAPE	6								6																			
HOFMANN, UPPER		16						4		12									1				X						
PRINGLE, UPPER		2							1	1									1				X	S	S			S	PLOWED FOR THIRTY YEARS
MAUD EATON, TEST VI, UPPER		3								3												S	X	S					
																	1		1			X		S					
HOFMANN, FIRST POTTERY		2(?)								2(?)												X							
FOSTER'S COVE, FIRST POTTERY		2								2																			
MAUD EATON, TEST VI, 1ST. POTTERY		2								2												X							
PRINGLE, FIRST POTTERY		?						X														X							
FOSTER'S COVE, MIDDLE		42	6					11	18		5		2		1	4													
PRINGLE, MIDDLE		18	5					9	4																				
MAUD EATON, TEST VI, MIDDLE		10	1					8	1																				
																							X						ALL MINERAL-TEMPERED
CLIFF SHELL HEAP, LOWER	COD	34	26	5					1	1		1										S	X						ONE COLLARED SHERD TWO ADZES
SETH'S SWAMP, LOWER		38	35		2					1																			
PEAKED HILL, LOWER	CAPE	11	1			10																							
PRINGLE, LOWER		3	1	1		1									1														
MAUD EATON, TEST VI, LOWER		6	4			2																							
FOSTER'S COVE, LOWER		19	17	2											3	1													
HOFMANN, LOWER		60	59			1																							

FIG. 8. Distribution of artifacts in seven stratified sites of eastern Massachusetts.

constricted necks and everted mouths. These containers are gray in color. Temper is finely crushed rock, sometimes mica schist, occasionally shell. As in the previous case, bodies are covered with fabric-wrapped paddle imprints which have been partially smoothed over or rubbed out. Necks have been left smooth (undecorated) or else their surfaces, having been imprinted with fabrics and partially rubbed smooth, are platted with the edge or corner of a wrapped paddle. In one example the outer edge of the rim has been notched with the edge of the paddle. In another case the flat top of the rim bears a row of punctated holes.

Historic wares consist of gray or tan, fine mineral- or shell-tempered vessels having Iroquois-like collars and castellations. While triangular areas and chevrons are usually incised on these collars, details of application frequently differ from those on Iroquoian vessels.[6] Decoration may be impressed instead of incised. Included in this group is a black vessel with castellated rim having filled-in incised diamonds on the side of the rim but, apparently, no collar.

Two other wares should be mentioned for sake of completeness. One consists of typical Castle Creek Owasco vessels. So far such pottery has been found archaeologically at only one site in Massachusetts, the Guida Farm site on the Westfield River in the western part of the state.[7] There, it was apparently associated with typical Mohawk (Hudson Valley Incised) pottery.

The other ware has also been found archaeologically at only one site in the state, the Clark's Pond shell heap at Ipswich.[8] This ware is characterized by a row of deep punctate holes which surround the vessels a short distance below the rim. This pottery is thought to indicate influences from Maine. The ware is similar to both Early and Late Intermediate wares but is a little thicker. Temper is usually medium coarse crushed rock and the color, gray to tan. Shapes are like those of Late Intermediate vessels but rims are notched with the edge or side of an unwrapped paddle. Decoration, found in addition to the punctate holes, includes dashed lines, rocker imprints, and those of cord-wound sticks.

[6] For illustrations see Bullen, 1946*b*, Fig. 21; Willoughby, 1924.

[7] Brooks, 1946, Pl. I: 30, Pl. II: 7–9.

[8] Bullen, N.D. *b*.

DISTRIBUTION OF TYPES AND CLASSES

Data from seven stratified sites in eastern Massachusetts have been classified according to the above typology and are presented in a tabulation (Fig. 8). Four of these sites are in the Shawsheen River Valley in the northeastern part of the state while the other three are on Cape Cod.

A few notes may be of assistance in interpreting this tabulation. For the Shawsheen Valley sites, "upper" refers to the loam, 6–10 inches thick, "middle" to the next 5 inches (including "first pottery"), and "lower" to greater depths. An exception to this is the Hofmann site at which the middle and lower zones are combined and called "lower." For Cape Cod sites, "upper" and "lower" refer to differently colored zones in the ground, such as a shell heap and the underlying sand.

At Foster's Cove some of the few corner-removed and small stemmed points, shown for loam, were associated with lenses of yellow-brown sand. It is believed these lenses resulted from the digging of pits by Indians and that these points were found in the loam for the same reason. Also at Foster's Cove, none of the triangular points in the middle zone were below corner-removed points of the same zone.

At all four of the Shawsheen Valley sites, Vinette Type 1 pottery was found in the upper 1–3 inches of yellow-brown sand (middle zone) which underlay the loam. In order to emphasize the probable associations of this pottery, it has been segregated from the rest of the middle zone. Two crude corner-notched (?) points were found at the Hofmann site in the lower stratum. No information is available as to their depth below the loam. They have been arbitrarily indicated for the zone of first pottery, this being their most likely vertical location. At Foster's Cove two side-notched points were found at the same relative depth as the lowest pottery. At Camp Maud Eaton the lowest pottery was clearly associated with two side-notched points. At Pringle there was an association between the lowest pottery and some of the small triangular and small stemmed points. At this site there was also an association between small triangular and small stemmed points and corner-removed points, but *not* between pottery and corner-removed points.

SEQUENCE IN NORTHEASTERN MASSACHUSETTS

Examination of the tabulation indicates two major archaeological periods in the Shawsheen

FIG. 8. Distribution of artifacts in seven stratified sites of eastern Massachusetts.

Valley. The first or preceramic period is one of transition during which the manufacture of corner-removed and a few straight stemmed and pointed stem points, made predominantly of patinated felsite or gray slate, gave way to that of small stemmed and small triangular points, made chiefly of quartz. At the very end of this period the first pottery, Vinette Type 1, and the first side-notched points are found. The succeeding ceramic period is characterized by many large triangular and a few corner-notched and large lanceolate points. These points are made of felsite which is dark and but slightly patinated.

For emphasis it may be mentioned that at Foster's Cove, in four of the tests at Camp Maud Eaton, and at Pringle direct superposition of worked materials was found: patinated felsite or gray slate, lowest; quartz, intermediate; dark felsite, highest. At Hofmann a quartz industry was entirely absent as were typical points usually made of that material. As at the other sites corner-removed points from Hofmann are much more patinated than are triangular points from the same site. The two crude corner-notched (?) points from this site are moderately patinated.

The pottery sequence indicated for the Shawsheen Valley sites has been developed by a combination of stratigraphic evidence and site-to-site correlation. That Vinette Type 1 pottery is the earliest seems beyond question based on stratigraphy. The main reason for the differentiation of Intermediate wares into an Early and a Late is the association of some Vinette Type 1 sherds with mineral-tempered Early Intermediate pottery in the upper zone of Camp Maud Eaton, Test VI, and the absence of Vinette Type 1 pottery in the upper zones of Hofmann and Foster's Cove. Consequently, the differently decorated, vegetable-tempered sherds in the upper zones of Foster's Cove and Hofmann have been called Late Intermediate.

The association of three corner-notched points with Early Intermediate pottery in the upper zone at Camp Maud Eaton, Test VI, their absence in the loam at Hofmann, and their reasonably deep average provenience in the loam at Foster's Cove suggest that these points are typical of an early ceramic period.

The small amount of Late Prehistoric 1 pottery at Foster's Cove was in the upper part of the ceramic zone. Collared, castellated, and incised sherds (Historic wares) at Camp Maud Eaton, Test VII, were found associated with fragments of gun flints and part of a brass arrow. Therefore, this is considered the latest ware of the area. Unfortunately, because of intensive cultivation, the Pringle site does not give sequential data concerning the ceramic period after Vinette Type 1 times.

Other artifacts in the Shawsheen Valley are rare. The use of graphite in the ceramic period, gouges in the intermediate or late preceramic period, and semilunar knives[9] in the early preceramic period are indicated. There is no question about early provenience for the latter. Of three fragments of such knives found at Foster's Cove, all were deeper than small triangular and small stemmed points and one was well within the zone of corner-removed points. At Camp Maud Eaton, Test VI, a nearly complete semilunar knife was found below the top of loose sand and gravel which marked the top of the zone containing corner-removed points. At Test VII, of the same site, a large fragment of ground slate with a ground edge, possibly from a similar knife, was found in the same lowest zone of loose sand and gravel. Although no corner-removed points were found in this lowest zone of Test VII, a straight base point was found there.

Before leaving the northeastern part of Massachusetts, two sites should be mentioned. One is the Van Steensburg site in the upper drainage of the Ipswich River.[10] This is a preceramic site and practically nothing was found in the loam. The underlying sand produced a few small triangular and corner-removed points, a pointed base point, several side-notched points of a type different from those previously mentioned, many asymmetric trianguloid knives (some of which are large isosceles triangles in shape but different from Shawsheen Valley points), and a pestle. This inventory is somewhat different from those of Shawsheen Valley sites and fairly close to that of the Vosburg of the Laurentian of New York. Nevertheless, it may be noted that small triangular, corner-removed, and pointed base points (and a pestle) were found in a preceramic horizon as in the Shawsheen Valley.

The other site is the Clark's Pond shell heap in Ipswich.[11] At that site incised (Historic) and

[9] For illustrations of these semilunar knives see Bullen, 1946*a*, Fig. 12, E and G; Bullen, 1946*b*, Fig. 20.

[10] Bullen, N.D. *a*.

[11] Bullen, N.D. *b*.

Late Prehistoric 2 pottery were found in a limited area associated with fragments of white clay pipe stems and articles made of brass. Late Prehistoric 3 vessels were also limited in areal distribution and apparently late, as were fragments of aboriginal pipes. The rest of the site produced punctated wares and projectile points or knives, similar to those found in Maine, associated with Early Intermediate pottery and other specimens. Triangular and corner-notched points (and a celt) were concentrated in the shell while small stemmed and corner-removed points were concentrated below shell. The chronological situation at Clark's Pond, while complicated by influences from Maine, agrees with the sequential arrangement presented above for the Shawsheen Valley.

SEQUENCE IN SOUTHEASTERN MASSACHUSETTS

Returning to the tabulation and the three stratified sites on Cape Cod, we find corner-removed, straight-stemmed, straight-base, and pointed-base points below triangular points. All points of the lower zones of these sites are made of felsite except at the Cliff shell heap where they were made chiefly of quartz.[12] The triangular points of the upper zones are made of felsite, quartz, and quartzite. At Seth's Swamp most of the small triangular points are made of quartz and most of the large triangular points of felsite. Unfortunately no data are available regarding relative depths of small and large triangular points in the loam at Seth's Swamp. At this site, as at sites previously mentioned, corner-removed points of felsite are heavily patinated while triangular points of this material are not.[13] One corner-notched point is shown for the lower zone at Seth's Swamp. This point, a large spear point or knife, was found at the junction between the upper and lower zones.[14]

The sequence of projectile points for Cape Cod agrees with that of northeastern Massachusetts. The major difference is the lack, at these three sites, of small stemmed points. Such points are, however, plentiful in southeastern Massachusetts. While the sequential arrangement of pottery wares, shown in the tabulation, is in agreement with that of northeastern Massachusetts, pottery seems to occur relatively earlier on Cape Cod. At Seth's Swamp and the Cliff shell heap Early Intermediate sherds were found in the lower or corner-removed zone. Whether this pottery was actually associated with these points or whether these sherds were only in the top part of the lower zone with a preceramic horizon below is not known. Superposition of shell-tempered Late Prehistoric 1 pottery over mineral-tempered Early Intermediate sherds at Seth's Swamp is important and shows the temporal relationship between these wares.

Polished celts and a pipe were found in the upper zones at Peaked Hill[15] and Seth's Swamp.[16] The resultant late provenience agrees with information given earlier for these artifacts at Clark's Pond in Ipswich. The same association was found by Moffett at the Ryder Beach site,[17] also on Cape Cod. Tests there produced eight large triangular points, a celt, fragments of two pipes, and four sherds. The latter are shell-tempered body sherds with cord-paddled exteriors. It is not certain whether they are Early Intermediate or Late Prehistoric 2 in type. A similar association may be cited for the Ipswich area in northeastern Massachusetts. At the Neck Creek shell-heap tests uncovered four large triangular points, a celt, and many sherds.[18] The latter are a mixture of Early and Late Intermediate wares.

A polished celt, excavated by Delabarre at Grassy Island, an early site in the Taunton River, may be cited as an exception to relatively late occurrence of this implement.[19] This site is below mean tide and the archaeological situation was at least blurred by tidal action. The balance of the inventory, to be discussed later, appears old, i.e., to date from a period not later than the introduction of Vinette Type 1 pottery. Until other celts are found with similar associations little can be said. The Grassy Island celt may be the earliest celt in eastern Massachusetts.

Another Cape Cod site, the Rose site, is of interest. Moffett, in reporting part of the collections from this site, illustrates large triangular, corner-notched, and small stemmed points,

[12] Mr. Ross Moffett, Provincetown, Mass., personal communication; see also Bullen, 1946*c*.

[13] Torrey, 1946.

[14] Mr. Howard Torrey, Reading, Mass., personal communication.

[15] Moffett, 1946*b*.

[16] Torrey, 1946.

[17] Moffett, 1946*a*.

[18] Bullen and Burtt, 1947.

[19] Johnson and Raup, 1947, p. 29 and Pl. III: 20.

Early Intermediate and Late Prehistoric 1 pottery. Included in the Rose collection are notched pebbles, gorgets, steatite sherds, a grooved axe, and celts. That this site was stratified and that the collection may not be presumed to represent one period in time was proven by tests made by Moffett and Rogers at one edge of the site. They found that "Triangular points of quartz and felsite were rather plentiful, but confined entirely to the black [or upper] layer. An unexpected feature, at least not indicated by the Rose collection, was the presence of about a dozen . . . [straight stemmed and straight base] points. Most of these were of quartzite, and their mean depth was distinctly lower than that of the triangular points. In fact, all but four were in the sand below the black."[20]

Suggestions of stratigraphy seem to be the rule, rather than the exception, in eastern Massachusetts. Tenuous suggestions of culture change with depth are present in data from the Squam Pond site on Nantucket,[21] the Faulkner Spring site near Taunton,[22] the Davis Farm site in Sudbury,[23] a site in Middleboro,[24] and several other sites on Cape Cod and in the Shawsheen River Valley.[25] At the Hemenway site on Cape Cod, Johnson found projectile points but no pottery in yellow sand at considerable depths below a pottery-producing shell heap.[26]

Another example is the Ford site near Taunton.[27] There, in spite of considerable disburbance, all large triangular and all corner-notched points were in the upper or ceramic zone while all corner-removed points, of which there were only a few, were in a lower preceramic zone. A great many small triangular points were found in both zones. Most of the small amount of pottery, found at the base of the upper zone, is either Vinette Type 1 or Early Intermediate in type, judging from the description. Also at this site gouges, a semilunar knife, and a pestle were in the preceramic horizon, while graphite and bannerstones were in both zones. Part of a gouge with three musket balls and gorget and bannerstone fragments with two musket balls were found in pockets of dark-colored soil (pits?). These associations may be fortuitous, may indicate a late survival of these artifacts, or may be part of an Indian's relic collection. In spite of the associations in these pits(?), data from the Ford site agree with and strengthen the outline of sequential changes in material culture as presented earlier from other sites in eastern Massachusetts.

The Jones Pond shell heap on the eastern shore of Narragansett Bay is in the southeastern Massachusetts geographical area although located in Rhode Island. Brown's report of the excavation of this site is the first published evidence of sequential stratigraphy in southern New England.[28] Triangular points (large triangular, judging from the only one illustrated) were found only in the upper zone while other types (straight base and pointed base) were also found at greater depths. Various types of side-notched points were present but it is not clear from the report just where they were found. The situation regarding pottery at Jones Pond agrees with that presented earlier in this paper. Brown writes, "Grit tempered sherds were largely found in lower depths than shell tempered ones."[29] These sherds would be classified under the system used in this paper as Early Intermediate and Late Prehistoric 2 wares, respectively.

COMPARISON WITH OTHER AREAS

At Throgs Neck in New York City, Skinner reported triangular points late, an elongate form of side-notched point both early and late, pointed-stem points early, and mentioned a corner-removed point as the deepest found.[30] At Koens-Crispen in New Jersey, Hawkes and Linton found many corner-removed and a few pointed stem points in the lower horizon, while triangular, small stemmed, and corner-notched points with pottery were in the higher horizon.[31] This pottery, to judge from the illustration, is very similar to Vinette Type 1. The sequence for these two sites agrees remarkably well with that of eastern Massachusetts.

Smith, using seriation supplemented by some stratigraphy, has postulated a culture sequence for coastal New York which parallels in many

[20] Moffett, 1946*a*, pp. 21 and 23.

[21] Bullen and Brooks, 1947.

[22] Mr. Maurice Robbins, Attleboro, Mass., personal communication.

[23] Bullen, 1946*c*.

[24] *Ibid.*

[25] Bullen, N.D. *a*.

[26] Johnson, 1942*a*, p. 29.

[27] Robbins, 1946; also personal communication.

[28] Brown, 1939.

[29] *Ibid.*

[30] Skinner, 1919.

[31] Hawkes and Linton, 1916.

details that presented in this paper for eastern Massachusetts.[32] His earliest ceramic period, North Beach, includes mineral-tempered (no shell-tempered) pottery some of which is similar to Vinette Type 1. Projectile points are predominantly stemmed or side-notched while triangular forms are rare. Proceeding upwards in time, triangular points become dominant, and the use of shell instead of mineral aplastic increases. Collared vessels, usually decorated with incision, supersede those having affinities with the Intermediate wares of eastern Massachusetts. Rouse has shown that an analogous situation in respect to pottery probably exists in Connecticut and that the few available clues support Smith's hypotheses.[33] This information is important as it is from an area through which cultural influences may have been transmitted into eastern Massachusetts.

Such influences, affecting the lives of the prehistoric inhabitants of eastern Massachusetts, may be traced further to the west and south. Corner-removed and straight stemmed points are prominent in the "Archaic" of the Southeast[34] and in Adena.[35] Side-notched points are also found in Adena[36] and various types of side- and corner-notched and, apparently, some triangular points, in Hopewell. Later people in the north central part of the country seem to have preferred simple triangular shapes. This generalized sequence is the same as that found in eastern Massachusetts.

Certain similarities in pottery development over a large area may also be shown. Griffin in "The Adena People" points to a rather close relationship between Fayette Thick, an Adena ware, and Baumer period pottery. He then writes, "There are a number of marked regional and undoubtedly chronological variations but it [Baumer pottery] is at present [1945] believed to be the earliest Woodland pottery in the above mentioned area [lower Ohio Valley] and seems to represent the addition of pottery to the late hunting and fishing cultures of the Central Mississippi Valley."[37] Two pages later he adds, "The pottery from the lower levels at the Vinette site [in New York State], called Type 1 by Ritchie, has both cord and fabric impressed surfaces on the exterior and interior. This type of pottery is comparable to the description of Fayette Thick. [However] it does not have any indication of finger punctates nor are there any large lugs. This is probably the earliest ware in New York and seems to come in during the transition between Lamoka and Brewerton foci and the succeeding Point Peninsula and Middlesex cultural groups. In the New York area as in the Ohio Valley the dentate and rocker stamped pottery is definitely later than this early Woodland ware."[38]

The last statement could be extended to include eastern Massachusetts. Early and Late Intermediate wares are very similar to Point Peninsula pottery. It has been demonstrated in the Shawsheen Valley that these Intermediate wares are later than Vinette Type 1. These similar changes in shapes of projectile points and types of pottery strongly suggest responses in eastern Massachusetts, probably at a later date, to events occurring in the central part of the country.

CONCLUSIONS

Looking at the situation in eastern Massachusetts from this point of view, it is possible to attempt to interpret some of the influences as they appear. There is no evidence for any sharp break in cultural continuity nor for any mass migrations into the area. The picture is rather one of gradual culture change with time. New traits are added and old traits discarded but the culture, gradually modified by outside influences, local adaptations, and some local innovations, continues.

Present evidence, as mentioned earlier, indicates that the Indian cultures of eastern Massachusetts started from a base similar to that of the "Archaic." During this early period corner-removed and other large stemmed points were in use. No bannerstones or atlatl weights have been found, as yet, in this early horizon. Hammerstones, knives, drills, and scrapers were included in the tool kit. Adzes were found at Seth's Swamp. Semilunar knives occur in this period in the northern part of the area, apparently earlier than they are found in the southern part. Other tools may also have been in use.

Corner-removed points from Seth's Swamp and Pringle's are relatively large and heavy

[32] Smith, 1947.
[33] Rouse, 1947.
[34] Webb and DeJarnette, 1942.
[35] Webb and Snow, 1945, p. 83.
[36] *Ibid.*
[37] Griffin, in Webb and Snow, 1945, p. 226.
[38] *Ibid.*, p. 228.

suggesting the use of spears. At Hofmann these large points were, apparently, mixed with smaller and lighter ones of similar shapes. At Foster's Cove practically all corner-removed points were of the smaller and lighter variety. This suggests the possibility that the bow and arrow may have been introduced towards the end of this period.

While the tools recorded for this early period seem to be those of a simple hunting culture, life may not have been limited to isolated communities. Felsite, from which the inhabitants of the Shawsheen Valley in this period fashioned their tools, is not available in the valley. It had to be transported about twenty miles from the nearest source. Trade, trips to the sources for this material, or a seasonal round of travel may be implied. This might provide opportunity for diffusion of cultural traits.

The "Archaic" ended with a transition to the manufacture of small stemmed and small triangular points made of quartz. Apparently, the impetus for this change moved from south to north in eastern Massachusetts. This is believed to be the case because of the great quantity of these points in southern New England, their apparent mixture with corner-removed points at Grassy Island, the same mixture at Pringle, the superposition of these small points over corner-removed points at Foster's Cove and Camp Maud Eaton, and the great scarcity of such points in Maine. That this influence traveled from west to east along the northern shore of Long Island Sound may be tentatively suggested. By this time choppers, gouges, pestles, notched sinkers, bannerstones, and probably plummets and grooved axes were in use. The semilunar knife appears in the southern part of the area.

Shortly after this, various types of side-notched points are found. In the Shawsheen Valley certain of these forms appear simultaneously with the first pottery, Vinette Type 1. In the south this correlation is not clear. Apparently, side-notched points occurred there before pottery. Faulkner Spring and Grassy Island, in addition to the middle zones of Shawsheen Valley sites, are assignable to this period (about the time of first pottery).

At Faulkner Spring near Taunton, probably later than Grassy Island, most points are of the small stemmed type.[39] Major implements include choppers, gouges, grooved axes, pestles, a plummet, a bannerstone, and a semilunar knife. Numerous fragments of graphite are present. Three sherds were also found. None of these is of Vinette Type 1, nor were they very deep in the site.

The inventory of Grassy Island, also near Taunton, includes gouges, a chopper, a notched pebble, a notched axe, and the celt previously mentioned.[40] Projectile points include small triangular, small stemmed, side-notched, straight stemmed, pointed base, and corner-removed points. The percentage of the latter type is greater than at any other known site in the area except for lower zones of stratified sites. Some of the side-notched points are of the type which the author would correlate with the introduction of Vinette Type 1 pottery. The artifact producing zone at Grassy Island is only a short distance above low tide. It is doubtful whether pottery, if originally present, would have been preserved. In any event this site should date from about the period of first pottery and certainly after small triangular and small stemmed points were in use.

That steatite vessels were probably made at about this time is suggested by the results of a test made at Stewart's Island in Marion Harbor in southeastern Massachusetts. The artifact producing zone at this site is at mean sea level and beneath twenty-seven inches of peat. This situation is comparable to that at Grassy Island. In the test at Stewart's Island a few triangular points, made of quartz, and sherds of a steatite vessel were found.[41]

Grassy Island has been extensively studied by Johnson and Raup who arrived at an end date of circa 1200 A.D., after which the site could not have been inhabited.[42] There is no way of estimating how much earlier the site may have been abandoned. This end date is probably conservative as it does not seem to allow enough time for later cultural developments. Nevertheless, it dates the manufacture of small stemmed and small triangular points as at least that early.

Such points are typical of the middle zone of the Shawsheen Valley. The evidence from Grassy Island and the postulation of a south to north introduction of these points suggest their occurrence in the Shawsheen Valley by, at least, about 1200 A.D. It follows, therefore, that

[39] Robbins, 1944, Pl. IX.

[40] Johnson and Raup, 1947, p. 29.

[41] Robbins, 1943.

[42] Johnson and Raup, 1947, p. 57.

semilunar knives found in the valley in the preceding or corner-removed zone are still earlier. This point is important in any consideration of the origin of such knives which, at present, is shrouded in mystery.

At or about the time of the abandonment of Grassy Island, Vinette Type 1 pottery was introduced into the area, unquestionably from the west. In the Shawsheen Valley the period when this ceramic style was made seems to have been of short duration. A large amount of this pottery has been found around Plymouth[42] and on Nantucket[44] and Martha's Vineyard Islands. This suggests a longer time range for this ware in southeastern Massachusetts or a larger population in that area at that time.

The author believes that the Hornblower shell heap on Martha's Vineyard[45] may be considered an example of a Vinette Type 1 pottery site. The lithic collection is very close to that given for Faulkner Spring and Grassy Island except for the absence of grooved axes, a semilunar knife, or a polished celt. The major addition to the material culture is pottery, of which many sherds are Vinette Type 1 while some are Early and Late Intermediate in type.

In the north the Vinette Type 1 pottery period is quickly superseded by a period when early Intermediate wares, corner-notched and large triangular points of dark felsite are made. Influences similar to the Point Peninsula and, later, the Owasco (or Coastal) of New York may be suspected. These influences seem to persist and to end at about the time of historic contact with incised pottery having Iroquois-like collars. With this pottery are also found large lanceolate and very large triangular points.

In the southern part of the area the situation seems to be different. There late influences from New York seem to be less intense. There seems to be a surprising conservatism at work. Older things seem to persist, such as bannerstones at the Ford site. Projectile points instead of being exclusively large triangles, as in the north, consist of a mixture of large and small triangles. Occasional sherds of steatite vessels are found. As at the northern sites, large stone implements except for celts are rare. The pottery sequence, however, is similar and ends with Late Prehistoric or Historic wares, smoking pipes, and traces of acculturation.

The foregoing attempts at possible synthesis emphasize the fact that the culture history of the Indians of eastern Massachusetts cannot be properly interpreted except in its relationship to the culture history of the aborigines of the rest of eastern United States. With the emergence of recognized stratigraphic sequences and percentage trends in eastern Massachusetts, problems of culture dynamics and regional relationships can now be discussed.

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[42] Based on an examination of the collection of Mr. Jesse Brewer, Plymouth, Mass.

[44] Massachusetts Archaeological Society, records.

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GEORGE GRANT MacCURDY, 1863–1947

ROBERT W. EHRICH

ON November 15, 1947, Dr. George Grant MacCurdy was killed by an automobile while on his way to Florida. Although he was in his eighty-fifth year, his death came as a distinct shock to all who knew him. He had grown a little frail, perhaps, but he still had full possession of all his faculties and he retained to the full his enthusiasm for and his preoccupation with his chosen field of prehistory. There was a certain changeless quality about him which makes his loss all the more keenly felt.

Although originally a student of geology and biology, Dr. MacCurdy was so stimulated by the exhibit of the bones of Pithecanthropus at the International Zoological Congress held at Leyden in 1896 that he decided to devote himself exclusively to anthropology and prehistoric archaeology. During the following years his student days in the capitals of Europe channeled his major interests into the field of Old World archaeology, of which he became the leading exponent and authority outside of Europe.

On returning from Europe, Dr. MacCurdy became associated with the Peabody Museum at Yale University, where he received his Ph.D. in 1905. He remained there until 1931 when he became Professor Emeritus. Under his curatorship the archaeological and anthropological collections of the Peabody Museum were greatly expanded, and the older material was scientifically catalogued and arranged. Between 1910 and 1912 he also spent part of his time in cataloguing the prehistoric material of the American Museum of Natural History and in arranging it for exhibition.

Throughout this period and afterward he continued to travel widely, and he maintained his contact with anthropological developments abroad. In 1921, together with Mrs. MacCurdy and Dr. Charles Peabody, he founded the American School of Prehistoric Research, which first focused its interest on France, later on all of Europe, and eventually on the whole of the Old World. For the first eight years Dr. and Mrs. MacCurdy conducted the summer trips which introduced their students to European museums, collections, and sites; and they carried out several excavations, of which the Mousterian site of the *Abri des Merveilles* in the Vézère Valley is perhaps the best known. After the work at that site was finished in 1930, Dr. MacCurdy turned over to others most of the work abroad, but he continued as head of the school and participated in the direction of excavations and studies in which the school was interested. These ranged from sites in Czechoslovakia and the Danube Valley to the Near and Middle East. The most notable was the Neanderthaloid necropolis at Mount Carmel.

In the European field his preeminence is well known and his *Human Origins*, published in 1924, is a landmark in detailed and orderly synthesis of a vast amount of data. While much new material has since been brought to light, these two volumes remain indispensable to the student. Under his editorship, which he relinquished with his directorship of the school in 1945, the *Bulletin of the American School of Prehistoric Research* obtained wide recognition and included papers of scientific value. His far-reaching influence is perhaps even better attested by the fact that practically all of the American scholars who in recent years have contributed to our knowledge of the prehistory of Europe were, at one time or another, members of his school.

The significance of Dr. MacCurdy's work cannot be overestimated. Although his major interests always lay in Old World prehistory, he contributed both directly and indirectly to the development of anthropological thought in America. A perusal of his bibliography (to appear in the forthcoming *Bulletin of the American School of Prehistoric Research*) reveals his wide interest in American archaeology and anthropology. These articles on American problems are for the most part concentrated in the period preceding his marriage in 1919 and persist until 1923, the year before the appearance of *Human Origins*. It was only natural that the collaboration of Mrs. MacCurdy, who was also deeply interested in Old World prehistory and to whose support and encouragement he owed a great deal, combined with the universal recognition of the authoritative value of his major work, should have led him to concentrate his attention increasingly on his special field.

Outstanding among his works on American subjects are his writings on Chiriqui antiquities

and art. His analyses of art styles and his recognition of conventionalized motifs have long been regarded as important contributions.

Even more significant than his writings, however, was his whole-hearted participation in the fostering of interest in America during the formative years when anthropology was slowly gaining recognition as a discipline in its own right. His colleagues of that period remember him as always willing to undertake the routine jobs and spadework necessary to arouse and maintain popular and professional enthusiasm for scholarly subjects. Not only was he one of the founders of the American Anthropological Association, but he served it as Secretary from 1903 to 1916 and as President in 1930.

Lack of space precludes a listing of his many honors, but it should be mentioned here that he was a Vice-President of the International Congress of Prehistoric and Protohistoric Sciences and a permanent member of its committee. In 1937 he was a member of the organizing committee for the International Symposium on Early Man, held by the Academy of Natural Sciences of Philadelphia, and he was chosen to edit the volume *Early Man* in which the papers appeared. In 1946, at the close of his life, he was elected Vice-President of the Archaeological Institute of America.

Apart from his scholarly pursuits, the effects of Dr. MacCurdy's life have been widely felt. Not only did he stimulate younger men with his infectious enthusiasm, but he was always ready with encouragement and aid. His introduction of his students to the scientists of Europe has resulted in a network of many durable relationships both personal and professional; and his own concern for his foreign colleagues, both old friends and many whom he hardly knew, was great. His assistance to them was given without stint. His boundless kindness, courtesy, and warmth have through the years done much to promote international understanding and good will among those with whom he came in contact.

Dr. MacCurdy lived a very full life. Both as a scholar and as a person he contributed much to the world. He is remembered with great respect and warm affection.

Department of Sociology
and Anthropology
Brooklyn College
Brooklyn, N. Y.

JULIO C. TELLO, 1880–1947

S. K. Lothrop

JULIO César Tello, outstanding Peruvian archaeologist, was born on April 11, 1880, under humble circumstances in the Indian village of Huarochirí, Department of Lima, in the high Andes. He died on June 3, 1947, in the city of Lima and was buried with the pomp and pageantry accorded to a Minister of State. Tello was of almost pure Indian blood, of which he was proud. His father, Julian Tello, evidently was a man of local importance as he became alcalde, but the family was poor and Julio Tello's first memory was of playing on an adobe floor. His mother was María Asunción Rojas de Tello, a descendent of the last Inca *curaca* who governed Huarochiri. During his childhood, Julio's father made periodic journeys to the coast where he visited relatives in the small fishing villages south of Lima. He often took his son with him on these trips.

When Julio was eleven years old, an event took place which started him on his future career. His aunt María, who had worked for the Pardo family in Lima and who was then employed as a chambermaid in the presidential palace, visited Huarochirí and urged that young Julio be sent to Lima where he could get a proper education. His father and mother, after due discussion with his uncle Belisario, decided on this move and the family silver, hidden beneath the wheat, is said to have been dug out and sold in order to finance him.

On arriving in Lima at the age of twelve, Julio at first lodged with a barber, to whom he paid six soles a month. He was treated as a servant and, in later years, complained that he had to do the family wash. He next obtained a post as third *mayor domo* in the house of the leading physician of Lima, where his duties permitted him to attend school. This was a fortunate break, for he was able to study at

Julio C. Tello, 1880–1947.
(Photo Wilhelmy.)

the Colegio de Osma, where he won scholarships, and it drew his interest to the field of medicine.

In 1901 Tello entered the Universidad Mayor de San Marcos, the oldest institution of learning in the New World, where he took successive degrees in science and in medicine. He supported himself by working in the Museo Raimondi, the Biblioteca Nacional, and in a hospital. His doctor's thesis on the antiquity of syphilis in Peru was accepted by acclamation in 1907. It was published by the Faculty of Medicine with a dedication to Ricardo Palma, noted writer, who greatly assisted Tello in his early days.

At this stage in his career, Tello was one of a group of brilliant young scholars, many of whom have achieved fame. We may mention Victor Andrés Belaúnde; Antonio, Luis, and Oscar Miró Quesada; Juan Bautista de Lavalle; Pedro Oliveira; José Gálvez; Francisco García Calderón; and Manuel Vicente Villarán. Tello's abilities now won him a scholarship to study abroad. At first he leaned toward France, but decided on Harvard University when he was offered free tuition.

Tello's attention was first directed towards the ancient inhabitants of Peru when he was only seven or eight years old. At that time an older brother had been commissioned to collect skulls for Doctor Manuel A. Muñiz. Years later at San Marcos his interest was aroused by Muñiz and McGee's study of trephining,[1] the text of which he then was unable to read. Consequently at Harvard he took up the study of anthropology rather than medicine.

At Harvard Tello for a time found his way blocked by his ignorance of English. The late Professor Roland B. Dixon, however, tutored him in the evenings—a kindness of which he often spoke with gratitude. As a result, he soon could follow lectures intelligently and in due time he received the degree of Master of Arts. Tello always retained a strong affection for Harvard, which he mentioned in his will, written just before his death.[2]

As a result of this success Tello obtained another scholarship which took him to Europe in 1912. He visited England, France, and Germany and attended the Congress of Americanists in London, There he met and married Miss Olive Cheeseman, who was studying at London University. With a wife to support he decided to return to Peru and get a job. His funds, however, were exhausted and he had to borrow money for his journey from Professor Putnam of Harvard.

On reaching Lima, Tello was appointed Director of the Department of Archaeology in the Museo Histórico Nacional and thus was in a position to initiate the long series of field trips and excavations which gave him his profound knowledge of Peruvian archaeology. The scope of his work is reflected by the appended bibliography and by the publications of his associates.

In 1913 Tello accompanied the late Dr. Aleš Hrdlička on a field trip which resulted in the large collection of skeletal material in the U. S. National Museum. On this journey they visited Huarochirí, where a three-day festival was held in Tello's honor. Other expeditions under the auspices of Dr. Javier Prado to Nasca, Cuzco, Ancash, Huari, and Chavín were undertaken in the years 1915–19.

In 1921 Tello published his first general estimate of the development of Peruvian culture, a small booklet entitled *Introducción á la historia antigua del Perú*. This set forth the then novel but now common idea that the basic development of high culture took place in the mountains and thence spread to the coast, where special local developments occurred. Furthermore, the importance of Chavín as a basic culture was recognized for the first time. Many of Tello's later works are elucidations of these ideas in the light of new facts.

Tello's knowledge and ability were recognized in 1923 by his appointment as Director of the Archaeological Museum in San Marcos University. In 1924 he also was made Director of the Museo Arqueólogo Nacional. Both of these he reclassified and reorganized. In 1919 Tello began to lecture at the University of San Marcos and in 1923 he received a professorship. In 1924 he gave the first full course on anthropology. Many of the now outstanding figures in Peruvian politics and economy were his students and became his friends.

In 1925 and 1926 Dr. A. L. Kroeber came to Peru in search of field data necessary for publication of Uhle collections in the University of California. He and Tello conducted joint excavations. In 1925 Tello also made a short field

[1] Manuel Antonio Muñiz and W. J. McGee, "Primitive Trephining in Peru," *Annual Report of the Bureau of American Ethnology*, No. 16, Washington, 1897.

[2] I am indebted to Dr. Alberto Arca Parró for a copy of this document.

trip with the writer which resulted in the discovery of the Paracas sites which Tello later excavated.

At the age of fifty, Tello apparently was settled in a routine and peaceful life. He had his professorship at the university and the directorship of two museums. He had funds for research. Trouble, however, was coming. In 1917 Tello had been elected to Congress as a deputy to represent his native Huarochirí. He never was opposed or ran for election during the eleven years he served, but during this period he was subjected to bitter attacks by his personal enemies.[3] In October of 1930, the so-called *onceño*, the eleven year dictatorship of President Leguía, came to a violent end.[4] Tello had been Leguía's friend and had supported him in Congress. Consequently, when his enemies came into power, Tello found himself without a paid job.

The next five years were difficult ones for Peru and for Tello. After the downfall of Leguía there had been four successive provisional governments; Sánchez Cerro had been elected president and assassinated; Benavides had been appointed president by Congress and had put down an Aprista revolt with an iron hand. During this period Tello lived in obscurity and poverty. He never again entered politics but devoted himself solely to archaeology. He was supported by a group of fantastically loyal assistants who had worked with him for years and stuck with him when times were bad.

In 1935 Mr. Nelson Rockefeller visited Peru and asked Tello to show him the textiles from Paracas. He also saw the unopened mummy bundles which were deteriorating owing to lack of proper storage. As a result he made Tello a generous grant. Shortly afterwards President Benavides appeared unexpectedly and spent several hours with Tello inspecting the collections. Remarking that what was good enough for Rockefeller to support was good enough for Peru, Benavides ordered Tello to build a new museum to house the Paracas collections and promised him the funds and a free hand to do it.

Thus the Museo de Antropología was founded, occupying part of the hacienda in Magdalena Vieja where Bolivar had lived during his stay in Peru. The building was old and not entirely suitable for a museum, but Tello had money and government support and extraordinary material to display. He thus was able to install exhibitions of great beauty and to create a large technical staff to work on the repairs and preservation of specimens.

In 1936 Tello came to the United States to visit museums and to secure technical backing and cooperation. As a consequence, after a series of conferences and with the financial backing of Mrs. Truxton Beale and the Hon. Robert Woods Bliss, the Institute of Andean Research was founded, which has promoted a great body of field work and publication in Latin America, particularly in Peru.

Returning to Peru, Tello entered a period of great activity. Work in his museum was proceeding apace. He made important field trips: to Batan Grande near Lambayeque, to Cerro Sechín near Casma, to Nepeña, and to the Marañon. This resulted in great new collections for the museum and in new vistas of the Peruvian past.

In 1939, the Congress of Americanists met in two sections, one in Mexico, which Tello attended, and one in Peru, in the organization of which he took an active part. The formal opening of the new museum took place at this time in a night ceremony with brilliantly garbed Indians from Huarochirí dancing on the replica of the huge Nepeña altar which had been erected in the outer patio.

In May of the following year, Tello started excavations and reconstruction at the famous ruins of Pachacamac, which continued intermittently until his death. Although Uhle had supposedly made an exhaustive study of the site, Tello soon found below the visible buildings an older city constructed of stone. Underneath lay a third city, in part as much as 20 meters beneath the surface. Here was beautiful masonry of the type known as Inca in the highlands, a discovery which has yet to be fully appraised. This level contained large stone pools fed by underground aqueducts, through which water from an unknown source again flows. The restoration of the complex building known as the *mamacona* led to the rediscovery of the ancient process of waterproofing adobe, which should prove of great industrial importance.

The work at Pachacamac was interrupted at

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[3] See Emílio Gutiérrez de Quintanilla, *El Manco Capac de la arqueología peruana, Julio C. Tello (Señor de Huarochirí)*, Lima, 1922.

[4] It is worth recording that, when Leguía's residence was looted, Tello waited outside and purchased for a sol the great Chimu silver jar he later gave to the museum at Magdalena Vieja.

times by other field trips. In 1941[5] Tello revisited Chavín for the third time. During the following year, with a grant from the Viking Fund, he made a long overland trip which resulted in important discoveries in the vicinity of Ayacucho and Wiñay Wayna near Machu Picchu. In 1933 he worked on a Paracas-type site at Ocucaje. In 1944 he discovered stratified graves at Cajamarquilla. His last great discoveries were a classical Chavín site near Cajamarca in northern Peru and vast cemeteries of early date under the town of Ancón near Lima.

Shortly before his death, all the archaeological museums of Peru were unified and Tello was placed in charge. This meant that the three great museums of Lima became a single unit, housed in Magdalena Vieja. Some years previously, Tello had received a gift of a large tract of land behind the museum. This he willed to the government, thus providing ample room for expansion in any future which can be foreseen.

To appraise Tello and his work is not easy. He liked to speak of himself as a humble Indian but, although his home life and tastes were simple, he was a very complex individual. Kroeber has called him a human dynamo. The writer agrees that vigor was an outstanding characteristic. It carried him through some thirty major field trips and innumerable lesser ones. Although he normally spoke quietly he was a forceful orator and keen debater. It was not easy to discuss archaeological theory and problems with him because he clung to his own ideas tenaciously and was always able to produce a fantastic fund of facts. On the other hand, if asked for fact or opinion, he gave it with great generosity. His Indian background and strong personality often aroused opposition but he was always ready to fight to gain his ends. He used to say that his success in life was due to his enemies.

At the same time, Tello had a host of friends in all walks of life who admired his enthusiasm and learning as well as his humor and kindness. On a field trip there could be no more considerate companion. In general conversation he was amusing and well informed. His staff at the museum was devoted to him and worked for him with a loyalty which was almost a religion.

[5] At 8:00 A.M. of January 17, 1945, a glacial lake broke through its walls and buried the modern town and ancient ruins of Chavín under a mantle of earth and boulders many feet deep.

Tello's publications frankly are not all one could hope for. He disliked writing and often stated that he wanted to leave his notes and collections so ordered that others could publish them. He wrote comparatively few documented monographs and rarely published the technical details of his excavations. A great deal of his work appeared in local newspapers, which, for economic reasons, often were his only outlet. This is unfortunate as the material is important and it is difficult to obtain. The University of San Marcos, to which he willed his notes and valuable library, expects to bring out his unpublished material in a series of thirteen volumes. It is to be hoped that the newspaper articles will be incorporated in a single volume.

The real key to Tello's character lay in his love of Peru. He developed not a nationalistic or outspoken patriotism but a keen understanding of the land and a deep devotion to its inhabitants. To him his country was essentially Indian and his desire was to improve the Indian way of life. This first led him to the field of medicine which he never actively practiced but in which he never lost his interest. In Congress he favored the building of roads, the construction of new irrigation systems, and social legislation which was not passed at the time but much of which has since become law.

As an archaeologist, Tello believed that Peruvians of all classes must realize with pride that their country contains the seeds of greatness as demonstrated by a series of brilliant autochthonous civilizations, which may be compared favorably with contemporary cultures anywhere in the world. And he has gone far towards realizing this end: by erecting the finest archaeological museum in South America, by training a versatile and competent staff to care for it, and by planning for future growth and expansion. Yet Tello's aim perhaps was most enhanced by the example of his own successful career. It is indeed inspirational that an Indian from Huarochirí was buried in state with the notables of the land attending amid salvos of artillery and that his countrymen rank him high in their history with Garcilaso de la Vega and Tupac Amaru.[6]

[6] As this goes to press, I have received from Dr. Rebeca Carrión Cachot an account of Tello's final burial on June 4, 1948. His body rests, as he requested in his will, in a tomb behind the present museum on the land deeded to him and the museum by his friend Germán Luna Iglesias. The museum of the future will be built around this spot.

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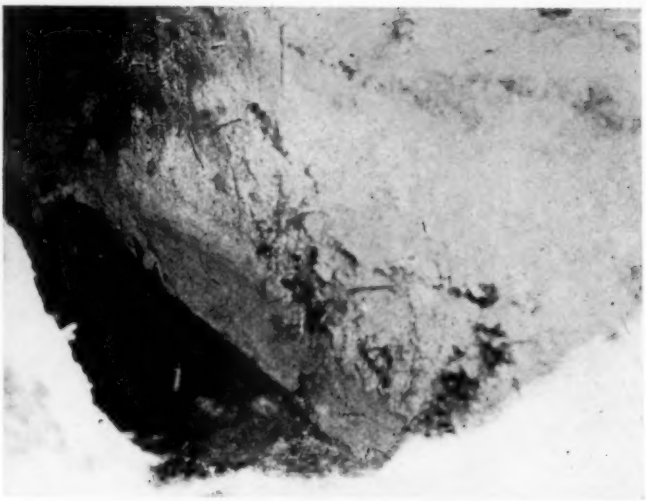
Peabody Museum
Cambridge, Mass.

[9] The illustrations in the editions cited vary in number and subject.

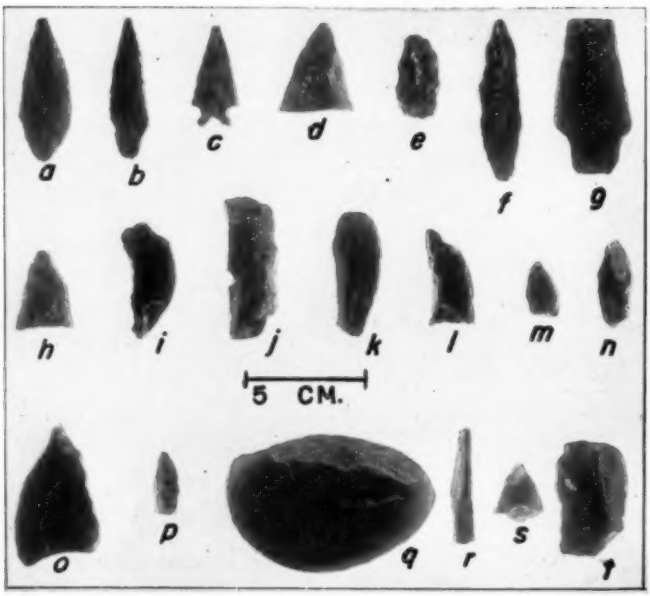
B

A

Views of the Odell Lake site, Oregon. A, looking northwest along the Odell Lake outlet; site is on the reader's left, approximately 75 yards in from the point marked X. B, looking east down the Odell Lake outlet; photo taken from the same position as in A; it shows the present forest of yellow (ponderosa) and jack pine.



A



B

Excavation and artifacts at the Odell Lake site, Oregon. A, portion of stratitrench, on slope; trowel stands in excavated moraine; contact of pumice and till is clean and sharp. B, artifacts described in the text.

FACTS AND COMMENTS

ODELL LAKE SITE: A NEW PALEO-INDIAN CAMP-SITE IN OREGON*

In the summer of 1937, a new paleo-Indian site was discovered at the south end of Odell Lake in Oregon. Odell Lake (Pl. VI), lies in a glacial trough just east of the divide in the Cascade Mountains, in T 23 S, R 6½ E, Willamette Meridian. The elevation of the lake is 4,792 feet (Deschutes National Forest Map, Willamette Meridian, 1947).

In the summer of 1946, the proprietors, Wilson J. Wade and Charles A. Porter, were excavating for the foundations and basement of a lodge on the south side of the outlet of Odell Lake on a bench or terrace at the east end, about 25 feet above the lake. Richard P. Bottcher, Engineer of the U. S. Forest Service, Deschutes National Forest, was present. The excavation went through a bed of pumice and into the glacial moraine on which it rests. Bottcher picked up points which he thought came from under the pumice. He showed these to Mr. Phil Brogan of Bend, Oregon, Managing Editor of the *Bend Bulletin*, who was aware of the previous finds under Crater Lake pumice. Brogan shortly afterward called my attention to the site.

Later I arranged with Mr. Porter to get in touch with me in case any evidence suggesting pre-pumice occupation should be found in later construction work. On July 2, Porter's son, while digging a pit for a septic tank just east of the lodge, found flakes and a point in the decomposed glacial till under the pumice. I received word that night at our field camp in the Klamath Indian Reservation and the next morning with my field assistant, Mr. Robert Merz, went to Odell Lake.

We found in the till large numbers of flakes and spall scrapers. We then cut back the till on the east end of the pit under the pumice[1] about 3 inches. Porter found a fine point *in situ* about 10 inches down in the till. The point is slightly suggestive of the Sandia Type "A" variety. Charcoal of pine wood was also found in the till, apparently from old fire lenses.[2]

In September, the writer accompanied by Dr. Ira Allison, Professor of Geology, Oregon State College, and Dr. W. D. Smith, formerly Professor of Geology, University of Oregon, examined the location.

Allison and Smith felt that since there was a slight slope above the terrace there was a possibility that the original deposit of pumice had been washed out by wave action and a later redeposition had occurred by erosion from the slope above. A trench from the bench to the slope showing the character of the deposit would make possible an answer to the question of the nature of the deposits.

On October 11 and 12, two students (R. L. Curtis and C. A. Reetz), Arnold Shotwell, Preparator of the Museum of Natural History, and I dug a trench to answer the question of the nature of the deposition of the pumice. The trench was about 30 feet long, 3 feet wide, and averaged between 5 and 6 feet in depth.

The stratification showed clearly that the deposit of pumice was primary (Pl. VII, A). The till contained no gravel, as would have been the case if it had been a beach, and the order of pumice from bottom to the top was the characteristic ty. e found in the deposits derived from Mt. Mazama, fine grains mixed with crystalline materials on the bottom changing into the coarser materials toward the top.

From the till we removed large numbers of flakes, several undistinctive points, a hammerstone and fragments of charcoal.

Dr. Allison arrived October 12 to examine the exposure and observed the removal of flakes and charcoal from the till. His report on the stratification follows:

> "I am satisfied that except for surficial weathering, rodent burrows, and disturbances by plant roots, the pumice layer at the Odell site represents the original airlaid fall of pumice from Mount Mazama and that it is, therefore, a dependable time marker. As the artifacts are imbedded in the weathered material at the top of the glacial till where no disturbing effects of roots and rodents are present, such artifacts are clearly older than the climactic eruption of Mount Mazama and hence more than 10,000 and perhaps more than 14,000 years old."

That this locality was a campsite is shown by the numerous chips and charcoal. How long before the eruption of Mount Mazama the paleo-Indians camped here cannot be stated. Artifacts occur at least a foot deep in the till, but of course, they may have worked down from its surface. On the other hand, they could represent occupation in the final stages of moraine building.

No further work is possible at the site because it is now occupied as a resort. We are under obligation to the proprietors for their sense of the importance of the problem and for their alertness in cooperating in its solution.

ARTIFACTS

Plate VII, B shows the identifiable points, scrapers, a hammerstone, and some flakes. Specimens *c*, *g*, and *h* were found by Bottcher. Specimen *a* is the point found *in situ* in the septic tank pit; *b* was found in the pit before we arrived to examine it. A chert scraper, *j*, was found in the pit. Some of the flakes and scrapers we took from the pit while the others came from the later trench. The hammerstone came from the trench.

Specimen *c* is so unlike the other points that there is some question whether or not it belongs to this series from under the pumice. However, the material, a green-gray obsidian, is like that of some of the other specimens from under the pumice. *b*, *c*, *f*, and *g* are clearly projectile points, while *d*, *h*, and *s* are fragments of points or blades. *m* may be a bro-

* I am indebted to grants from the Viking Fund, Inc., of New York, and the General Research Council of the University of Oregon in support of the field work in 1947 in connection with which this work was carried out. I wish also to thank the U. S. Forest Service of the Department of Agriculture for a permit to work on land under its jurisdiction. This site was reported in a paper read at the American Anthropological Association and Society for American Archaeology meetings at Albuquerque, 1947, and before the section on Geology and Geography of the Oregon Academy of Science, January 17, 1948.

[1] Dr. Howell Williams and Dr. Ira Allison identified the pumice as Mt. Mazama pumice.

[2] Dr. Ralph Chaney, University of California, kindly identified the charcoal specimens.

ken point which has been resharpened. *n* may have been a poorly made point or short knife. *p* is a flake from a partially shaped nodule.

a has a clearly marked shoulder on the left edge while the other edge curves back gradually. It is thick along the longitudinal axis. The edges are sharp and serrated. The material is green-gray obsidian.

b shows a contracting stem with marked shoulders. It is thin, perhaps because it is made from thin, igneous flow rock. The edges are serrated and sharp.

g is made of the same material as *b* and is quite thin. The hammerstone is made from a small piece of gravel. We call it a hammerstone because it was in the till where charcoal and many flakes were found and there were no other pieces of gravel in the till. The area from which chips have been broken off was evidently the striking surface. Had the chips been detached by exfoliation as a result of weathering, they would probably have been loosely attached to the rock since they would have been held in place by pressure of the surrounding earth.

The interesting feature of these points is their variability of pattern. If *c* belongs with the series the variation is even more striking. Taking the others which are certainly from under the pumice, we have a general pattern of a modified-leaf-shape point. *a* suggests the Sandia "A" type and *g* a Yuma, both, however, rather weakly. All specimens came from just under the surface of the till to a depth of 15 or 18 inches with the concentration about 8 to 12 inches. The limited conditions under which we had to dig made useless any finer stratigraphic control.

In a series of papers from 1937 to 1943, I have called attention to evidence of paleo-Indian occupation of Oregon as shown by stratified sites under Mt. Mazama (Crater Lake) pumice. The first reported locality was on the Deschutes River (Cressman, 1937) while the others were in the Summer Lake Caves near Paisley (Cressman, 1942). During the 1947 field season, a cave on the Klamath Reservation showed Mt. Mazama pumice covering occupation materials. Since this pumice is apparently water laid it will not be clear, until further work is done, whether it can be used for dating.

The Odell Lake site is in the Deschutes drainage. The previous finds along the Deschutes have all been of one or two specimens left by their owners. The Odell Lake site, on the other hand, is a camp site as shown by the great number of flakes, the hammerstone, the fire lenses, and charcoal recovered from them. Furthermore, the occupation of the site, even seasonal as it must have been at that altitude (in early October, when we dug the trench it was cold enough at night to freeze water sufficiently hard in pipes to burst them), must have lasted over a long period of time as shown by the depth in the till to which artifacts extended. The Odell Lake site should be classed as a summer hunting locality (perhaps fishing, but we have no evidence).

The points line up more closely with those from the Lower Klamath Lake locality, the early post-pluvial horizon at the Narrows (Cressman, 1942, Fig. 98, *b*), than with our early cave specimens from the Basin. The topography from Odell Lake slopes away with slight relief to the east and passage to the south into the Klamath Lake basin by way of the Klamath Marsh would be quite easy. The Klamath Basin would provide a relatively favorable wintering area. We have assigned the Narrows horizon in the lower Klamath Lake bed to the early post-pluvial, probably near its termination. If these points are related closely in type and time of use to those from the Narrows, the time for that horizon would have to be pushed further back into the early post-pluvial. The Odell Lake points are not less than 10,000 years old and, as Allison states, perhaps more than 14,000 depending on the date of the Mt. Mazama eruption. However, in view of the fact that the occupation of the moraine must have gone on for a considerable length of time before the eruption, probably a greater antiquity might be assigned them than the minimum above.

No animal bones were found for paleontological correlation.

The moraine represents the Tioga glaciation or the last phase of the Wisconsin. However, too little is known of the history of glaciation in this area to estimate the date when occupation of the Odell Lake site would have been possible. The glacial history of the area is an important problem for further study.

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L. S. CRESSMAN
Department of Anthropology
University of Oregon
Eugene, Oregon
February, 1948

TREE-RINGS AND DROUGHTS

Harold S. Gladwin in a recent publication voiced a question of vital importance to Southwestern archaeology. Can dendrochronology tell us anything concerning the effects of climate on aboriginal agriculture?

Both Douglass and Schulman have claimed that correlations can be established between tree-growth and *winter* precipitation, but each of them has been explicit in saying that *summer* rainfall has little, if any effect upon the growth of trees. Since it would seem that summer rainfall, during the crop-growing months, is the only season of moisture which could effect the agricultural well being of Pueblo peoples, I do not see how narrow tree-rings can be regarded as providing any indications of economic disaster in ancient times.[1]

It is generally acknowledged that plant growth depends upon a combination of the factors of water supply, temperature in the growing season, sunlight for photosynthesis, humidity and cloudiness as it influences transpiration, and supply of materials for manufacture of food. Fluctuations of the climatic factors influence tree growth. In Alaska the mean temperature of the growing season correlates closely with the tree-ring record.[2] In New England it was found that the April–August rainfall is the factor reflected in the tree growth.[3] In the Southwest where there is plenty of sunlight and generally a long growing season, rainfall is the critical item. Tree-ring width correlates most closely with the winter rainfall, October through May. Schulman checked this in five different areas of the Southwest.[4]

At first glance this might appear to separate summer crops from climatic factors influencing tree growth. In the Southwest rainfall follows a distinctive pattern wherein the winter rainy season extends from December through March (Table 6). The widespread cyclonic storms are usually gentle and may be of several days' duration. In the higher altitudes precipitation falls as snow. While only 35 per cent of the year's rainfall occurs during this period, much of it soaks into the soil. The spring months of April, May, and June constitute a normal period of drought. June is often without precipitation. The summer rains begin in July and continue into September. They are of a spontaneous nature, short-lived, and are often accompanied by wind, thunder, and lightning.[5] Almost every summer has one or more of these storms with more than an inch of rain. Because of their sudden, violent nature much of the moisture is lost by run-off, and only a relatively small amount soaks into the soil. Accompanying wind, occasional hail, and flooding may damage the crops. Further, the intense sun and heat after summer rains greatly increases evaporation. Very little of the moisture penetrates the soil.

The period from December through April is sometimes called the "Storage Period," and the period from May through August constitutes the period of greatest transpiration and evaporation, with the resulting depletion of soil moisture and a minimum of ground water recharge.[6]

This seasonal cycle of precipitation is of great importance in agriculture. The Hopi, for example, make their first planting of corn by April 15 for harvest in July. This is the beginning of the summer rainy season. The main planting is from the middle of May to the first of June to avoid late frosts which might catch the early planting. The second planting, therefore, falls during the normal spring drought. Harvest is done late in September which often is after the first frost.[7]

There is not enough rainfall during the growing season to raise and mature the crop. Stored moisture is depended upon to sprout the seed and carry it through until the summer rains. Natural storage occurs in several ways. The dry farmer depends upon the winter moisture that soaked into the soil. When irrigation from springs or streams is used, the dependence is mainly upon the melting of winter snows. After a prolonged period of drought and during a season of high temperatures, an inch or more of rain is needed to prepare the soil for crop growth. The summer rains come too late to raise most crops, but, in most cases, a minimum is needed to bring the crop to maturity. The winter moisture is, therefore, the most critical. Without a sufficient supply of soil moisture to start the crop and carry it through until July, there would be no crop for the summer rains to mature.

TABLE 6. MEAN PRECIPITATION FOR ARIZONA[8]

Months	Inches	Seasons	Inches
January	1.26	Winter	3.82
February	1.33	Spring	1.95
March	1.06	Summer	4.74
April	.57	Fall	2.94
May	.32		
June	.33		
July	2.13		
August	2.28		
September	1.20		
October	.81		
November	.93		
December	1.23		
	13.45		

The ideal way to obtain absolute validation of the above fact would be to compare statistically the crop yield for each year with the actual rainfall during the accompanying winter and summer seasons. In Arizona there are no major dry farming areas, and few crop data for dry farming are available. Limited data are available from the University of Arizona Experimental Dry Farm at Prescott, Arizona.[9]

The short crop records (Table 7) show a closer correlation between winter moisture and crop yield than between summer rain and crop yield. Note that the two crop fail-

[1] Gladwin, 1946, p. 9.
[2] Giddings, 1943, p. 29.
[3] Lyons, 1936.
[4] Schulman, 1942.
[5] Smith, 1945, pp. 13–14.
[6] Hoyt, 1938, pp. 4–7.
[7] Hack, 1942, p. 20.
[8] Anonymous, 1941, p. 765.
[9] Clark, 1931.

ures for sorghum (1921 and 1923) were after winter droughts. The failure in 1921 came even though that year had the maximum summer rain in the series. The yields

TABLE 7. RELATIONSHIP OF SEASONAL RAIN TO CROPS AT THE PRESCOTT DRY-FARM[10]

Year	Rainfall			Crop in Lbs.	
	Oct.-May	June-Sept.	Total	Hopi Corn	Beans
1912	11.85	9.50	21.35	1,124	742
1913	7.69	7.04	14.73	736	486
1914	5.03	6.81	11.84	470	282
1915	11.22	5.33	16.55	784	776
				Sorghum Silage	
1920	12.08	3.81	15.89	2,300	
1921	4.64	9.41	14.05	drought, no crop	
1922	9.60	9.20	18.80	cattle destroyed crop	
1923	5.32	7.39	12.71	drought, no crop	
1924	6.53	2.25	8.78	2,520	
1925	6.30	8.29	14.59	2,500	
1926	9.60	5.42	15.02	1,799	
1927	8.41	7.85	16.26	3,658	

for 1924 and 1925 were nearly the same with almost the same winter moisture, but there was a great difference (2.25 and 8.29 inches) for the summer rains. The year 1927 is at odds with this argument. However, examination of the rainfall by months shows that there was an unusually heavy rainfall in June (0.95). The importance of winter rain to carry through the spring is seen in the following statement.

> Over a period of 36 years only twice, in 1917 and 1926, was there sufficient moisture in April, May or June to put the ground in condition for planting spring crops. This is the critical period for maturing winter crops and for the preparation of ground and the planting of summer crops.[11]

The vital role of winter moisture continues eastward into the Plains dry-farming areas of eastern New Mexico. There, although 75 per cent of the rainfall is in the months of April through September, the best yields were in years with high winter rainfall.[12] Modern agricultural practices throughout western dry-farming areas call for special treatment of the soil so that it will absorb and store the winter moisture.[13]

Winter moisture is of utmost importance to stream flow and irrigation. Farmers of irrigated valleys anxiously watch the mountains in the winter. It has been found that the available water in April, May, and June can be predicted on the basis of winter rain and snow before the end of March. Spring rains that might affect the run-off are so rare as to be a negligible factor.[14]

[10] *Ibid.*, pp. 584–609.
[11] *Ibid.*, p. 586.
[12] Hauter, Walker, and Wells, 1930, pp. 12–13.
[13] Hobart and Harris, 1946.
[14] Smith and Booker, 1940.

Soils that naturally retain the rainfall have long been prized. The volcanic ash fall from the eruption of Sunset Crater covered a large area. The distribution of late Pueblo II and early Pueblo III sites in the Flagstaff area conforms to the distribution of ash. The value of this ash cover as a mulch in preserving moisture is clearly shown by the fact that today trees growing in soil with such a cover have a thicker average ring width than do similar trees just outside the ash area.[15]

It is an error to assume that the season of tree growth, which is correlated most closely and sensitively with the October–May rainfall, is completely different from that of Indian agricultural crops. In the Flagstaff area actual daily and hourly measurements of the changes in the diameter of the trunk showed that the rapid growth period is in late May or June and the heavy rains of July and August had little effect. In other words, tree growth takes place during spring drought and is dependent upon winter moisture stored in the soil.[16] This is the same period when the summer crops of corn must get their start.

In summary, an ample supply of winter moisture is needed to sprout the seed and to support growth until the summer rains begin. A certain amount of summer rain is needed primarily to mature the crop. However there will be no crop to mature if there is a winter deficiency of rain. Since a narrow tree ring indicates deficient winter moisture it is reasonable to conclude that the crops of that year were also adversely affected. Therefore, a drought seen in the tree-ring record in the Southwest is also a sign of adverse weather conditions for the contemporary agricultural peoples.

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WILFRID C. BAILEY
Dept. of Anthropology
University of Texas
Austin, Texas.
February, 1948

NOTE ON THE MAYA ECLIPSE TABLE OF THE DRESDEN CODEX

In the January issue Robert Merrill reviews a study of mine called *Concepts and Structures of Maya Calendrical Arithmetics*. Considering the flinty nature of the material I wish he had noted that there is a section devoted to "Summary." Two "Appendices" also failed to get mentioned, but the other sections are characterized briefly. Section XV was mistakenly grouped with others as dealing with "analysis of various moon formulae." In it, a moon formula is simply assumed, and the subject is a theory, admittedly incomplete, as to how the Maya computer of the Eclipse Table on pp. 51–8 of the *Dresden Codex* may have been able to do as well as he did without understanding the celestial mechanics involved. Thus, this short section has a bearing on just how "gifted" the much-praised ancient Maya astronomer-priests really were. Perhaps that is why my good friend Merrill devotes nearly half of his space to remarks of his own concerning the related phenomena of lunations and eclipses.

What is said either disagrees flatly, or may seem not to harmonize, with certain points made in my paper. These not only affect a proper estimate of the "intellectual level" of the ancient Maya—they ought to be considered in deriving precise day-for-day correlations of Maya and Christian chronologies. Evidently I did not emphasize them sufficiently, for Merrill seems to be stating matters on which all are agreed. A little discussion may be useful.

The Eclipse Table of the Codex advances one in time by a series of 69 steps, each step evidently intended to be by a number or group of complete moons. Sixty are 6-moon groups, but this dominant pattern is disturbed by the insertion of nine 5-moon groups, each separated from the next by a number of 6-moon groups. The presence of these 5-moon groups is what tells us that eclipses are involved. There is good reason for believing that each group, whether of five or of six moons, was made up of formal 29-day and 30-day moons, but the recorded table merely permits certain knowledge of the intended total number of days in each group. The computer did not give us the anatomy or structure of each group in terms of a pattern of 29-day and 30-day values for the moons making up the group. The following little tables do this for two hypothetical 5-moon groups, separated by single 6-moon groups. In either, if we added more 6-moon groups, we would have a pattern of 5-moon and 6-moon groups corresponding to a portion of the recorded table. But the structures of some groups differ, notwithstanding the fact that if we total up the days of each group in either Table A or Table B we get the series 177-148-177-148-177.

A	B
30–29–30–29–30–29	30–29–30–29–30–29
30–29–30–29–30	30–29–30–29–30
29–30–29–30–29–30	30*29–30–29–30–29
30*30–29–30–29	30–29–30–29–30
30–29–30–29–30–29	30*29–30–29–30–29

In the codex, each of the nine 5-moon groups totals 148 days. In my tables, if I had continued to alternate the 29-day and 30-day types without interruption, my second 5-moon group would have totaled 147 days only—and if we went on, every other such group would come out 147 days. To gain agreement with the 148-day requirement I have corrected those lunations marked with asterisks. In Table A I have raised a moon from a "normal" 29-day value to a 30-day value. That is all there is to it. I have called this a "simple" correction and Merrill calls it a "full" day correction. In Table B I have corrected two 29-day lunations in this manner, raising each by a full day, to 30 days. But in addition, after each correction in this table, the sequence of types in any pair of moons is reversed. These alternative methods are discussed in detail in my paper, pp. 91–103. I called the second sort a "reversal" correction, while Merrill calls it a "half-day" correction, though only full days are manipulated. The reversal or "half-day" method can be used to obtain a more accurate approach to correct average results than is possible with the simple method, as

shown in detail on pp. 99–101 of my paper. Guthe used it to get a pattern showing only 148-day totals for 5-moon groups, as in my Table B. Merrill now says that this is the only possible solution for these groups. It would then follow that the Maya possessed a device for obtaining greater accuracy in whole-day lunar schemes than was possible without it. On p. 96 of my paper I pointed out that simple corrections can be used to avoid 147-day groups and I offer Table A as a demonstration of what seemed too simple a proposition to require lengthy explanation. Surely Merrill is mistaken on this point.

Still bearing in mind the question of how accurate Maya whole-day lunar calculations may have been, I quote from the review: "A regular alternation of 30-day and 29-day moons . . . required two half days or one full day correction in order to keep up with the moon's average of 29.53 days." For this to be true we must understand the requirement to be that no formal lunation shall deviate from the position of the true-average moon to which it corresponds by even a few hundredths of a day more than the greatest deviation absolutely required by the non-use of fractions of a day in the formal scheme. Whether the Eclipse Table used reversal corrections or not, the table failed to achieve this ideal accuracy by a wide margin. Many of the data analyzed in my Sections XII and XIII tend toward the conclusion that such a high degree of accuracy was never sought and not required for the Maya problems. Our own problem, I think, is to discover what the actual inaccuracies were, and then to account for them. It is important to remember that good whole-day predicting systems can be constructed without the ideal equation of 1004 days for 34 moons. Even with it such systems cannot do better than to predict a series of days on which sequent moons will end according to the formal scheme, with the actual lunar phase falling on the predicted day, or on the day before or after it.

Merrill seems to accept the view that the Eclipse Table gives three sequent *isolkin* days at each entry in order to allow for this fact. If that is their function (as I have argued, following Guthe and Teeple) the degree of accuracy in the lunar correction scheme becomes a matter of minor importance, and no particular degree of accuracy is essential to good results. We should keep in mind that the Maya probably *did not* recognize any requirement of "two half days or one full day correction every 34 lunations."

While granting that the Eclipse Table states three sequent days to define a three-day limit within which lunations will be observed to end, in addition Merrill says that the three-day periods "named the three days of moon disappearance in each of the 69 moon groups, during which sun eclipses had been observed." To prevent misconception of the last phrase, let the reader note that this does not mean the Maya ever saw anything like 69 eclipses in a single 11959-day or 11960-day period covered by the table. As to the first phrase, I submit that single sets of three sequent days cannot allow for lunar variation, so that eclipses may fall on any one of them—and at the same time cover a supposed three-day period of moon disappearance. If such a double function for the three-day groups is a possibility to be reckoned with, we ought to have a demonstration. It is important that we do not over-simplify the problem of a complete understanding of the Maya approach to their most difficult astronomical problem, but neither should we complicate it unnecessarily.

LINTON SATTERTHWAITE
University Museum
University of Pennsylvania
March, 1948

NOTES ON THE ARCHAEOLOGY OF THE UTUKOK RIVER, NORTHWESTERN ALASKA*

Early in May 1947, a United States Geological Survey field party of five was flown by ski plane to the headwaters of the Utukok River in northwestern Alaska, about 200 miles southwest of Barrow. Three 18-foot canvas boats of a special folding design were taken in along with enough equipment for four months. Food caches had been flown in to six localities on the 200-mile-long river a short time before the group landed. When the "break-up" came late in May the party started down the river working out the geology of the area from a series of 18 camps which were established before reaching the Arctic Ocean in August.

FIG. 9. Folsom point from the headwaters of the Utukok River, Alaska.

During the season 17 archaeological sites were discovered. It is believed that most of these sites are of Eskimo origin and are probably fairly recent. However, an important exception is a well-made Folsom point, announcement of which has been made.[1] The Folsom point was picked up by Edward G. Sable, identified by the writer, and brought back by him to present to the Smithsonian Institution (Fig. 9). One knife blade was found by Ernest H. Wadsworth and the remainder of the material and sites were discovered by the writer. All of the material which could be taken out is now in the Smithsonian. Time was not available for more than a cursory examination of the localities and to collect surface artifacts and random chips. The iden-

* Published by permission of the Director, U. S. Geological Survey.
[1] AMERICAN ANTIQUITY, Vol. 13, No. 3, p. 268. 1948.

tifications are those of the writer but have been reviewed by specialists of the Smithsonian.

This report is intended not as a formal treatise but rather to place on record notes concerning a rather inaccessible region that has probably never been visited by an archaeologist. It may be of value to those who are interested in Eskimo culture and migration and should be an assurance to anyone contemplating archaeological work in the Arctic interior that the Utukok drainage contains many possibilities. The Folsom discovery should add to the controversial Mackenzie River migration theories, and should do much to bolster the courage of those who have believed in the great antiquity of certain cultural remains that have been found in Alaska.

TABLE 8. ARTIFACT LIST

Locality	*Artifacts and Descriptions*	*Material*	*Chips*
1A	1 end scraper.	Black chert	C
	1 knife, 2.7×1.5 inches, coarsely chipped.	Black chert	
	1 blade, fragment, 4.5×2.5 inches.	Black chert	
2A	1 knife, crude.	Black chert	A
3A	1 knife, 3.3×2.0 inches, 0.5 inch thick, thin patina on one side.	Blue-gray chert	C
	1 retouched fragment possibly a drill, patina covered.	Blue-gray chert	
	1 knife point, straight break, 1.7×2.0 inches.	Black chert	
4A	1 knife point, 2 inches of tip, 1.5 inches wide.	Black chert	A
	1 chip, thin, slight retouching.	Black chert	
	1 chip, thin, slight retouching.	Light blue chert	
	1 scraper, slight retouching.	Light blue chert	
	1 scraper, side and end combination, 3.5×1.7×0.5 inches.	Light blue chert	
5A	1 arrow (?) point, thin parallel chips, running to center.	Dark blue-gray chert	C
	1 end scraper, not retouched.	Blue-gray chert	
	1 side scraper, slight retouching.	Blue-gray chert	
	1 knife point, large crude chips.	Blue-gray chert	
6A	1 scraper (?), large crude piece with possible retouching.	Blue-gray chert	C
	1 scraper (?), small, slight retouching.	Dark gray chert	
	3 chips, possibly retouched.	Dark gray chert	
7A	1 knife, 3.5 inches long on one side, 1.7 inches wide on one end, gently curved to 0.7 inch on other end, coarse chips but well made.	Dark blue-gray chert	R
8A	Folsom point, 2.2×0.8 inches, slightly dulled along 0.5 inch of each side at back. One side has a narrow central channel flake with additional narrow flakes parallel to each edge. Found on the surface of a sandstone ridge.	Black chert	R
9A	1 knife, 4×1.2×0.4 inches, broken, matching pieces found in same place.	Light blue-gray chert	A
	1 knife, 3×1.3 inches, 0.5 inch thick, crudely shaped and chipped, matching pieces found together.	Dark blue-gray chert	
	1 knife point, broken, 2.5×1.5 inches.	Light blue chert	
	1 knife point, broken, 1.8×1.0 inches.	Light blue chert	
	3 knife points.	Dull purple chert	
10A	1 blade, 2.5×0.9 inches, about 0.3 inch of tip broken, base stemmed and 0.3 inch long by 0.3 inch wide.	Light gray chert	R
11A	Village site, probably recent. About 20 igloo (?) sites and various small rectangular depressions. Not investigated.		

TABLE 8. (*Continued*)

Locality	*Artifacts and Descriptions*	*Material*	*Chips*
12 A	Village site, probably all recent. About 20 rectangular depressions ranging from 6×10 to 2×2 feet; several round and irregular-shaped depressions. A few of the depressions were examined and found to contain material down to the permanently frozen layer. Material consisted of carved bone, elephant ivory, and walrus ivory, a stone hammer, a stone lamp, a crude stone knife, a few potsherds (typical coarse, crumbly Eskimo type), and in one pit a brass cartridge case. Several pits had a pavement of sandstone slabs laid on the bottom. One pit had very large sandstone slabs, slightly inclined from the vertical, placed to form a wedge with the "V" pointing to the west. Charcoal and masses of animal bone, mainly caribou and bear, were common in the pits. One depression was a chert workshop, for it was littered with thousands of tiny fragments of chert and flint. It was impossible to take the larger specimens out because of overloaded boats.	Vari-colored chert	A
13A	Hill tops littered with chippings.	Vari-colored chert	A
14A	Hill tops littered with chippings.	Vari-colored chert	A
15A	Eskimo skeleton, partially buried in tundra along the river bank. Only the skull was taken; the individual was apparently large. Several large chert cores and a caribou skull from which the antlers had been hacked were associated.		
16A	Recent campsite, pits and igloos made of bent-willow framework covered with caribou hides.		
17A	Tolageak: signs of habitation on this point range from old to recent. Small bone seal spear found under 3 feet of alluvium in wave-cut bank.		

Good material is abundant in the river gravels. Vari-colored chert, derived from rocks of Mississippian and Triassic age in the Brooks Range to the south, is the predominant lithologic type. Most of the sites are near the river and contain numerous river boulders of chert. The sites are usually littered with chips, many of which, although not often retouched, have dulled cutting edges indicating that they are artifacts.

On the accompanying map (Fig. 10) the sites are located and numbered from 1A to 17A in the order of discovery. The map has been traced from the Army Air Forces Preliminary Base (Tigara 64 C) compiled from AAF trimetrogon photography by the U. S. Geological Survey.

It will be noted that a series of east-west trending ridges have been shown on the map by a single line of hachures. Most of the sites are located on or near these ridges. In marked contrast to the difficult terrain of the lower tundra-covered areas, these ridges are easy to walk on and probably served not only as a pathway but also as a landmark to the interior. Further search for the remains of Folsom Man might well be directed to these ridge-top trails that lead from the vicinity of the coastal regions to the inland rivers. If such remains are present there would be little chance that they have ever been disturbed.

In order to give some idea of the type of material found, an abstracted artifact list is included for each locality (Table 8). The relative amount of chippings at each of the sites is indicated by letters: R is rare, C is common, and A is abundant. Most of the larger specimens from the one village site that was examined were left behind because of overloaded boats. Of possible interest is the fact that pottery was discovered at only one locality, in an old village site.

RAYMOND M. THOMPSON
U. S. Geological Survey
University of Wyoming
Laramie, Wyoming
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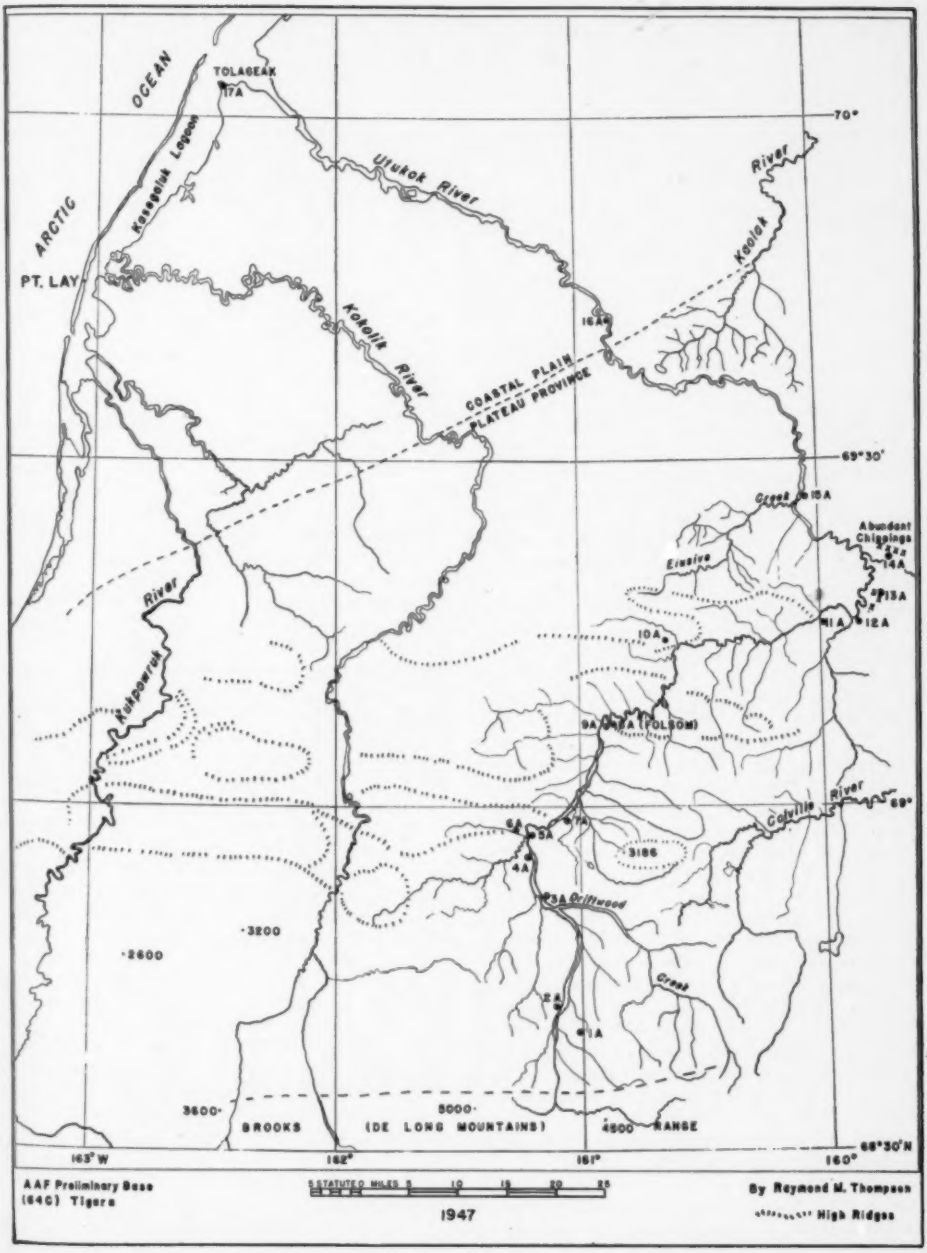

FIG. 10. Map showing archaeological sites along the Utukok River, Alaska.

BOOK REVIEWS

Prehistoric Ceramic Styles of Lowland South America, their Distribution and History. GEORGE D. HOWARD. Yale University Publications in Anthropology, No. 37. New Haven, 1947. 95 pages, 15 plates, 15 figures. $1.50.

Recent years have seen a tremendous advance in our knowledge of the prehistoric cultures of Andean South America, but to date the lowland area has not received similar attention. Our knowledge of it is limited to sporadic and widely separated sites documented with varying degrees of incompleteness and unreliability. In this paper, presented as a doctoral dissertation at Yale University, George Howard has attempted to bring some order into the jumble of material and to draw some tentative conclusions about the temporal and spatial relationships of the ceramic types. No attempt was made to deal with any but the ceramic material, it alone being abundant enough and sufficiently widely distributed for comparative study under the present conditions. Use was made of all the museum collections in this country, as well as the available literature.

The unevenness of the data required the application of special methods of analysis in order to arrive at some degree of standardization and comparability. Believing that "procedures of artifact analysis, description, and definition which are behavioristic should yield results of greater validity when applied to the data than many of those previously used which were frequently intuitive," Howard used the concepts of "style," "trait," and "complex." "By ceramic style is meant the aggregate of the pottery traits which distinguish a collection as a unit. Ideally each style treated in this paper should represent a homogeneous population from the standpoint of statistical theory. . . . The trait, which is any observable characteristic which is meaningful in comparing and contrasting various artifacts, is the minimal component of the ceramic style. A trait complex is a characteristic grouping of traits occurring within a style and a style may contain a series of complexes. The component traits of a complex have a unity in time and space" (pp. 14–15). For example, the Marajó style was found to share the following traits and complexes with the Maracá style: "Napo Anthropomorphic complex (anthropomorphic jar, anthropomorphic features in relief, polychrome painting, painted designs upon and between relief, wide and narrow painted linear elements, and painted lines alternately straight and sharply curved and angled), globular jar, burial urn, area in solid red, double painted line design, and incision."

Lowland South America was divided into four geographical divisions to facilitate the analysis. These are: (1) the Orinoco and West Indies, including British Guiana; (2) Amazonia; (3) Lowland Bolivia; (4) the Southeast, embracing lowland Argentina, Uruguay, Paraguay, and southern and eastern Brazil. Each of these is discussed separately in the report in terms of styles, traits, and complexes. At the conclusion of the analyses of the individual styles of each geographical division, the interrelationships of the traits and complexes constituting each style with those of each of the other styles is given in outline form, as in the example quoted above. It is to be regretted that some means could not have been found to include the series of tables "listing the traits diagnostic of the styles and their distribution among the styles of each of the four major areal divisions," which was contained in the original paper. As it is, the reader must sift these data out of the text, and it is difficult to judge how large a percentage of the total traits of each style the number shared with the other styles actually is.

By using this technique of comparative analysis, Howard was able to divide the styles within each of the four geographical areas into two groups characterized primarily by the presence or absence of painting, or in the case of Amazonia, of monochrome or polychrome painting. These are: for the Orinoco, Early (Early Ronquin, Cedros, Mayaro, Los Barrancos, La Cabrera, Cuevas) and Late (Arauquin, Late Ronquin, Valencia); for Amazonia, Polychrome (Napo, Mirakanguera, Cunany, Maracá, Marajó) and Santarem; for Lowland Bolivia, Painted (Lower Mound Velarde, Upper Mound Velarde, Mound Hernmarck) and Unpainted (Mound Masicito, Rio Palacios, Chimay); for the Southeast, Arroyo Malo and El Cerrillo.

Howard's findings may be summarized as follows: There is a much closer resemblance between the Early and Middle Period styles of the Orinoco and West Indies and the Polychrome styles of the Amazon than between any other combination of styles in the two areas, arguing for the possibility that the two were contemporary. Since the dateable pottery so far recovered from the Guianas belongs to a later period, it seems likely that contact took place at the headwaters of the Orinoco and Negro Rivers. The wide distribution of urn burial over the rest of the continent leads to the inference that it entered Venezuela from the south and in the Late Period. There are striking analogies between the Late Period styles of the Orinoco and Santarem, among them the presence of siliceous spicules in the paste, but Howard does not feel that this necessarily indicates diffusion rather than independent development. There is a clear-cut relationship between the Polychrome Division of the Amazon and the Painted Division of Lowland Bolivia. Urn burial here is apparently also intrusive from Amazonia. Since the incised styles of Lowland Bolivia show no specific relationship to known Amazonian styles, it seems possible to conclude that "a complex of traits of painted decoration unaccompanied by incision entered Lowland Bolivia from Amazonia and was assimilated into the local styles." In the Southeast, the Arroyo Malo style shows possible influence from the Amazonian Polychrome styles, while the affiliations of the El Cerrillo style are with the Mizque Incised style of Bolivia.

"Reviewing these distributional relationships for the total area it appears probable that the Amazonian region is the center of dispersal of certain traits such as urn burial and the complex of traits of polychrome decoration which diffused into Lowland Bolivia and the Southeast probably unaccompanied, in the case of the former, by incision. Per-

haps the polychrome decoration of the Orinoco and West Indies area originated in Amazonia, but if so, it underwent a certain degree of modification. . . . The history of the trait incision over the total area is almost impossible to reconstruct but several suggestions may be offered. In view of its absence in the Painted styles of Lowland Bolivia and in the Arroyo Malo style of the Southeast, it is suggested that it is a later development within the Amazonian area than polychrome painting. Thus, contrary to general opinion, the polychrome unincised pottery of Cunany might very well represent an early style. That incision diffused into the neighboring areas from Amazonia seems probable by virtue of its wide distribution in Amazonia and the high degree of elaboration it has received in at least one of the styles of this area, Marajó" (p. 86).

It is unfortunate, as Howard himself points out, that the Amazon area, which seems from his analysis to be of such great significance in the development of lowland ceramic styles, is the least known of the four divisions. He has made a valiant effort to draw historical conclusions from the meager data at his disposal and has arrived at some interesting hypotheses. Only extensive archeological fieldwork can establish their validity, together with that of the methodology employed to reach them.

BETTY J. MEGGERS
Department of Anthropology
Columbia University
New York, N. Y.

Some Notes on the Archaeology of the Department of Puno, Peru. MARION H. TSCHOPIK. Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 27, No. 3. Cambridge, 1946. 72 pp., 34 figs., 10 pls. $1.65.

This monograph is the third report on the Southern Peruvian program of the Peabody Museum, Harvard University.[1] The first, by Alfred Kidder, II,[2] presents a survey of early sites in the northern Titicaca Basin. The second, by John H. Rowe,[3] defines the basic Inca ceramic styles of Cuzco. Both are invaluable as a background for this report, which describes the late styles in the northern Titicaca Basin.

Forty-one sites are covered by the survey, all located on the Peruvian side of Lake Titicaca. Each is briefly described with notes on terraces, house foundations, fortification walls, chullpas, graves, petroglyphs, and rare relief carvings. Surface sherd collections were made at most of the sites, and some of the chullpas and graves were excavated.

The chullpas fall into four major types. The first is an above ground construction, made of well dressed stone, and is round, square, or rectangular in plan. A small door enters a chamber which usually has interior niches. The second is made of rough stone piled into a somewhat beehive-shaped dome. The third has a stone lined chamber below ground, with a stone faced tower above. The final type includes all chullpas of adobe construction, only some of which have stone foundations. The first has a distribution throughout the total area surveyed; the others are more restricted. The graves are either stone-lined subterranean cist tombs, or slab cist graves in which circles of up-ended slabs enclose a burial.

Little stratigraphic evidence for the time placement of sites, constructions, or ceramic styles was encountered. However, on the basis of distribution, affiliation with known styles elsewhere, and design sequences, the author arranges the numerous late styles in a tentative sequence. The styles are clearly defined, many for the first time, and are well illustrated. The present review follows the sequence order from early to late.

Rare pieces of Decadent Tiahuanaco style are found at a few sites, and probably represent the earliest period covered by this survey. Three major styles appear to fall between the Decadent Tiahuanaco and the Inca Periods, namely the Collao Black on Red, Allita Amaya Polychrome, and the Sillustani series. The Collao Black on Red is represented by bowls, cups, goblets, and jars decorated in somewhat crudely executed black designs. It is associated with the third type of chullpa, and has a wide distribution. Its resemblance to the "Post-Decadent Tiahuanaco" style found in Bolivia by Ryden[4] would serve to confirm the time placement, since the latter style is clearly isolated as post-Decadent Tiahuanaco at Khonkho. The Allita Amaya Polychrome is found only in slab cist graves. The ollas, pitchers, bowls, and jars are decorated in black designs, edged with white, on a red base. Again, resemblances to the Churajón style of Arequipa, Arica II of North Chile, and the Alfarcito Polychrome of Northwest Argentina confirm the pre-Inca time placement. The Sillustani series is subdivided into a Brown on Cream; Black on Red; Black and White on Red; and Polychrome. All are represented essentially by shallow open bowls with linear designs. Time placement is based on their association with chullpa types, their limited distribution, and their occurrence at sites which lack Inca styles.

Several local styles appear to fall between the ones described above and those which belong properly in the period of Inca occupation. These are named Chuquito Black on Red, Chuquito Polychrome, and Taraco Polychrome. The Chuquito Polychrome is the most distinctive and uses animal heads and insect motives in well executed designs. Association with chullpas of Types 1 and 4 is noted.

In the Inca series, six of the Cuzco styles defined by Rowe are found: Cuzco Polychrome A, Cuzco Polychrome B, Cuzco Red and White, Qoripata Polychrome, Huatanay Polychrome, and Urcusuyu Polychrome. All pertain to the Late Inca period. It is interesting that none of Rowe's Killke series of the Early Inca period is included. Chullpas of Type 2 are commonly associated as well as some of Types 1 and 4. These Inca styles have a wide distribution which, of course, extends into Bolivia, although detailed stylistic studies have not yet been made for that country.

[1] As Project 7, Institute of Andean Research programs of 1941–42. See the following review. *Editor.*

[2] Alfred Kidder, II, "Some Early Sites in the Northern Lake Titicaca Basin," *Papers of the Peabody Museum of American Archaeology and Ethnology*, Vol. 27, No. 1, Cambridge, 1943.

[3] John H. Rowe, "An Introduction to the Archaeology of Cuzco," *Papers of the Peabody Museum of American Archaeology and Ethnology*, Vol. 27, No. 2, Cambridge, 1944.

[4] Stig Rydén, *Archaeological Researches in the Highlands of Bolivia*, Göteborg, 1947.

A comparison of this survey with the one by Kidder emphasizes the sharp division between the Early and Late styles in the Titicaca Basin. In spite of the two excellent surveys, more excavation seems needed to complete the sequence. The principal merit of the present paper is that it fills in the late sequences, so obscure from Bolivian evidence. Detailed studies of this kind will ultimately make it possible to link the historical and traditional evidence on Inca origins and expansion with archaeological findings.

WENDELL C. BENNETT
Department of Anthropology
Yale University
New Haven, Conn.

Indian Skeletal Material from the Central Coast of Peru. MARSHALL T. NEWMAN. With a "Synopsis of the Archaeology" by GORDON R. WILLEY. Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University, Vol. 26, No. 4. Cambridge, 1947. 72 pages, 7 plates, 26 tables, 1 map. $2.50.

This monograph is another scientific report developing out of the programs in Latin America of the Institute of Andean Research under the general auspices of the Office of the Co-ordinator of Inter-American Affairs, Washington, D. C., in 1941–42 (Project 8—southern coast of Peru). Most of the Peruvian skeletal remains in museum collections have been so poorly documented as to archaeological horizons that inadequate data have prevented proper studies of the racial history of Peru. However, Dr. Neuman, by working in the field with Gordon Willey, was able to collect series of skeletal material from each of the four cultural periods of the Central Coast of Peru. As a result of this careful handling of skeletal material by archaeological horizon, Dr. Newman presents a unique attempt to elucidate the racial history of the Central Coast of Peru.

Two hundred and thirty-one crania, 151 male and 80 female, were obtained from seven archaeological sites. Although the skeletons were collected along with most of the crania, they were examined only for pathological changes. Measurements were made solely on the crania. The sample was inadequate in some respects, but a limited time in the field did not permit the collection of a larger series and the elimination of the heavily deformed crania further reduced the sample. The reviewer trusts that the more technical producedures and methods of measurements and the handling of the data will be discussed in physical anthropological journals as this review will deal with the significance of Dr. Newman's finds from an archaeological viewpoint.

The section written by Willey on the archaeology of the Central Coast provides a chronological framework for the seven archaeological sites from which Dr. Newman obtained skeletal material. His analysis is brief, but clear and concise, and strengthens the monograph as it provides a good archaeological background for Dr. Newman's physical anthropological observations. A cranial series was obtained from each of the four generally accepted culture periods of the Central Coast, arranged below in chronological order:

"Shell Mound" Period:	Incised Series (from Aspero and Lighthouse sites in Supe Valley).
Early Period:	Interlocking Series (from Pachacamac, Lurin Valley).
Middle Period:	Epigonal Series (from Necropolis at Ancon).
Late Period:	Late Chancay Series (from Lauri and Site A of Cerro de la Trinidad, Chancay Valley).
	Sub-Chancay Series (from Marques in Chilon Valley).

Dr. Newman in all his analyses and tables presents his skeletal and cranial material in reference to each of the above-designated archaeological periods, thus providing a valuable collection of anthropometric data for future comparative work in Peru. The cranial pathology and deformation in these series present a definite picture, but several interpretations of the metric and morphological differences are possible because of the original small series divided first by sex and then into four cultural periods. "By postulating separate racial groups from even a small number of statistically significant differences between chronologically arranged series, it is possible to conclude either that new racial elements have entered the picture or that a resurgence of old elements have taken place. At the opposite pole it is possible to lump the series into one racial group, minimizing the differences between them on the assumption that they are due to sampling errors and/or to distortion of cranial populations resulting from undetected deformation, and conclude therefore that they are in all likelihood samples of the same basic population." Dr. Newman conservatively assumes the middle course between these two points interpretation.

From his analysis and interpretation of the cranial material three main aspects can be summarized:

1. *Cranial Deformation.* The frequency and intensity of deformation (anterior-posterior) is greatest in the earliest ("Shell Mound") Period and least in the Late Period on the Central Coast, a situation just the reverse of that in other areas in the Americas.

2. *Pathology.* Both the crania and skeletons from the Central Coast are relatively free of pathological changes, an observation previously made by Hrdlička on materials from the North and Central Coast of Peru. Osteoporosis (usually an indication of insufficient intake of calcium, phosphorus, and vitamin D) of the vault and orbits is twice as frequent in the Interlocking Series as in the others and may indicate lowered nutritional status. The cultural data of the Interlocking cemeteries suggested an underprivileged group as compared with other burial sites and thus one might expect a lowered nutritional condition. Arthritis deformans appeared in only three skeletons of the Incised Series, with arthritic erosion of the glenoid fossa and mandibular condyles rather frequent in the Epigonal Series.

3. *Racial History.* The most evident change occurred between the "Shell Mound" and Early Periods, where apparently the intrusion of foreign racial elements and the occurrence of local differentiation caused discernible changes in the Central Coast population. The only clear-cut break in the ceramic continuity of the area also occurs between these two culture periods. However the evidence for an actual replacement of peoples is lacking. Because of the lack of similar anthropometric studies in other valleys, it is impossible at present to decide if the apparent differences from one period to the next are merely local or pan-Coastal. Dr. Newman suggests that the leveling of cranial differences in the Late Periods as compared to those fea-

tures of the earlier periods is probably due to an increased intermingling of people from different valleys. The earlier differences probably are only sub-racial variations, for taken as a whole the series of 231 crania does not represent a heterogenous population. "Rather they suggest a basic population of one racial stock which varies from period to period and valley to valley because of the amalgamation of outside racial elements and intra-valley genetic change. This basic racial group is characteristically short in stature, small vaulted, brachycranic, mostly high-headed, medium in facial proportions, below average in prognathism, medium-narrow in nasal aperture, and broad in palate."

Dr. Newman's study is a significant step toward completing the studies of man's history in Peru. It is hoped that his application of physical anthropological techniques to archaeologically oriented skeletal material is the beginning of many more studies, for undoubtedly additional studies of this nature, applied to the North and South Coast as well as to the Highlands, will produce a more comprehensive interpretation of the racial history of Peru.

CLIFFORD EVANS, JR.
Department of Anthropology
Columbia University
New York, N. Y.

The Archaic Horizon in Western Tennessee. THOMAS N. M. LEWIS AND MADELINE KNEBERG. Tennessee Anthropology Papers, No. 2. Knoxville, 1947.

As stated by the authors, the purpose of this publication is the preliminary presentation of the data from the earliest archaeological horizon in the state of Tennessee. The horizon consists of 11 "single component sites" on the Tennessee and Big Sandy rivers, which are grouped in the Eva Focus. Preliminary presentation was considered desirable since it will be some years before the detailed reports can be published.

The use of a graphic method of presentation, 18 plates of artifacts, one of burial positions, and one of cranial types, all well executed line drawings, serve the purpose admirably. These are supplemented by brief descriptions of the sites, which contain specific trait allocations in the case of pottery only; an extensive trait list which compares the Eva Focus as a whole with the Lauderdale and Indian Knoll foci; and a short general discussion.

A secondary motive for publication of the report was "to call attention to the probability of the Archaic culture having persisted up to a late period in Western Tennessee" (p. 14). A chronological chart gives a tentative end date for this "Archaic" manifestation of 1350. The authors, finding Baumer, Alexander, Middle Mississippi, and other wares on the sites, at times in "undisturbed deposits," feel that this indicates the persistence of the Archaic groups, acquiring pottery by trade but never making it, until the late date. They are also "inclined to believe that they may have survived into the late historical period as the ephemeral Mosopolea" (p. 15).

The reviewer is to be grouped among those whose existence the authors foresee, as "inclined to raise our eyebrows" (p. 10). One suspects that it will take the detailed reports, at the very least; to convince most archaeologists of these "probabilities."

WILLIAM H. SEARS
University of Michigan
Ann Arbor, Mich.

Prehistoric Indians of the Southwest. H. M. WORMINGTON. Popular Series, Colorado Museum of Natural History, No. 7. Denver, 1947. 191 pp., 58 figures.

Few popular books on Southwestern archaeology have appeared in recent years and those of the past stressed certain areas, were not well balanced, and at the present time are out of date.

Marie Wormington in the present little volume has supplied a real need in a very adequate manner. The book is divided into seven chapters with an appendix by Dr. Erik K. Reed on exhibit sites, modern pueblos, and local archaeological museums. The author has supplied a bibliography of 130 titles which include all of the more important contributions in the field, and an index. A chapter on early man is followed by others on the Anasazi, Hohokam, Mogollon, Sinagua, and Paytayan cultures.

The author has made a serious attempt to avoid technical terms and in general has been quite successful. For those who wish to make a hasty survey of the Southwestern field the book is to be recommended.

HAROLD S. COLTON
Museum of Northern Arizona
Flagstaff, Arizona

The Post-Kansan Geologic History of the Lower Platte Valley Area. GILBERT CARL LUENINGHOENER. University of Nebraska Studies, n. s., No. 2. Lincoln, 1947.

The author of this excellent study is Professor of Geology at Midland College, Fremont, Nebraska, and the study under review is based on the doctoral dissertation which Dr. Lueninghoener presented "in partial fulfillment" to the Department of Geology, University of Nebraska. The geological aspects of the thesis are here accepted as they were approved by the doctoral committee. This reviewer, no geologist, proposes to consider only those implications of the study which seem to have special interest for archaeologists, and particularly for those now engaged in active field work in the Plains area.

The author points out that this investigation is "essentially a geo-morphological study of the Lower Platte River Valley in eastern Nebraska" (p. 5). The procedure which he followed began with a detailed photogrammetric study of six Nebraska counties, located three on either side of the Platte River immediately above its confluence with the Missouri. Aerial photographs of this area were made available by the Agricultural Adjustment Administration.

Careful study of these aerial photographs, by stereoscopic techniques, permitted identification of terrace and valley fills, and of key exposures suitable for field study. The results of these field studies, supplemented by data from the records of local well-drillers, county soil maps, and other sources, are summarized in the detailed reports of sixteen selected profile sections. These data provide the body of the thesis. The author considers these several lines

of evidence, and reaches the conclusion that the post-Kansan history of the area can be expressed in a series of seven cycles, each one comprising "an erosion or valley-cutting followed by an interval of deposition or valley-filling" (p. 78). "The cycles were not identical repetitions," says Dr. Lueninghoener, "because the competency and erosive actions of streams varied from cycle to cycle" (p. 78), and he goes on to attribute these recurrences "mainly to the cyclic changes caused by the waxing and waning of the post-Kansan glaciers of the Pleistocene" (p. 78).

Each of the cycles identified is named and described. This summary of the cycles begins with the oldest, here called the "Post-Kansan Pre-Crete Cycle," and ends with an eighth, the "Present Cycle," which is described as a time of active erosion. Eight full-page illustrations, one for each episode, are an invaluable adjunct to the description. These text-figures clearly illustrate the important conclusion that "due to the repeated alluviations and entrenchments that have taken place, five different terrace levels have been developed in the lower Platte River Valley area. These are definite and recognizable morphological features" (p. 78).

The four cycles which immediately precede the "Present" seem to hold the greatest interest for the anthropologist. The oldest of these, here called the "Peorian or Fort Calhoun Cycle," includes the deposition of Lower Platte Terrace-Number 3 (LPT-3); the next oldest is the Linwood Cycle, during which time the LPT-3 fill was eroded and the LPT-2 fill was deposited. The next younger period is the Fremont Cycle, including an erosional epicycle followed by the building up of the LPT-1 fill. The aggradation episodes of the three cycles just named are tentatively correlated, in the order named, with the Tazewell-Cary, Mankato, and Cochrane glaciations respectively (p. 76). The most recent complete cycle, the Elm Creek, includes the deposition of the LPT-O fill, for which the author feels that some cause, other than glaciation, is implied (p. 76).

An important extension of these identifications appears in the statement that these four terraces "appear to correspond to the T^0, T^1, T^2, and T^3 of Schultz and Stout" (p. 15).[1] The presence of "Indian pottery" in the fill of LPT-O is twice mentioned (pp. 16, 75), but the precise location of these occurrences is not given and the statements are not documented. The bibliography, however, includes two monographs which deal with Central Plains archaeology, and the statements mentioned can probably be referred to one or the other of these sources.[2]

There are certain important implications in the relationships postulated between the newly-derived cycles and the post-Kansan glacial sequence. The correlation of these two sets of events, as the author sees it, is clearly visualized in Figure 29, and expressed in the following statement.

> The correlation in Figure 29 is based on the concepts that in geological time streams normally develop through a cycle of erosion (youth, maturity, old age) and that glaciations are climatic accidents which cause streams to aggrade. If these concepts are correct, then interglacial times are normal times of degradation. Stream deposition, during a glacial age, seems to have been caused by the overloading of the stream (p. 77).

The presentation is convincing, but it should be noted that opinions which seem somewhat at variance with the one just quoted have been expressed recently by geologists working on similar problems. Evans and Meade, for example, offer the following opinion in their study of Texas terraces.[3]

> It may be concluded, therefore, that each degradational stage indicates a period of increased humidity, and each aggradational stage a period of increased aridity over the entire plains region.

Lack of complete agreement need not surprise us, but the identification of the concomitant climates of the erosional and depositional stages of each cycle is of prime importance to anthropologists concerned with the reconstruction of the prehistory of the region. Dr. Lueninghoener, quite properly, did not speculate regarding the effects of these glacial and climatic fluctuations on any human populations of the area, but the possibilities are most intriguing.

This is not the first study of terrace problems with important archaeological implications, but it is one of the most detailed and thorough presentations of certain geological concepts which have seemed a little baffling to many field archaeologists. The bibliography appended to the study includes basic references, although omissions may be noted, such as, for example, the paper by Evans and Meade already cited, and the important studies by John T. Hack on Arizona terraces. The book, itself, is well-designed and carefully edited, and the excellent text-figures, the handiwork of the author, are an outstanding feature.

The real importance of this investigation to archaeologists, then, is not primarily in the excellence of the study as a geological report, but rather in certain implications only touched upon, very lightly, by the geologist. The main outlines of Plains prehistory have already been roughed in, but the demonstration of a series of geological events which archaeologists can correlate with their own time periods will provide a sharp working-tool for the Plains prehistorian. It will go far, for example, toward providing a usable time-scale for the so-called Lithic period, for which available stratigraphic evidence is neither abundant nor wholly satisfactory.

The time period which corresponds to the new Linwood Cycle and LPT-2, may include, if it does not coincide with, the Early Lithic period of the Central Plains. Fossil bison bones and the weapons of the men who killed them have been reported from western Nebraska terraces, identified as T^2. A careful re-examination of the published reports of Signal Butte I and the Scottsbluff Bison Quarry suggest the inclusion of both manifestations in the Early Lithic period, as a possible alternative to previous placements. The Fremont Cycle includes the time of deposition of the LPT-1 or T^1 terrace-fill. Remains included within this fill have been assigned to an Intermediate Lithic period, and, tentatively, would include such manifestations as Signal

[1] C. B. Schultz and T. M. Stout, "Pleistocene Loess Deposits of Nebraska," *American Journal of Science*, Vol. 243, No. 5, pp. 231–44, May, 1945.

[2] W. D. Strong, "An Introduction to Nebraska Archeology," *Smithsonian Miscellaneous Collections*, Vol. 93, No. 10, Washington, 1935.
John L. Champe, "Ash Hollow Cave," *University of Nebraska Studies*, N.S., No. 1, Lincoln, 1946.

[3] G. L. Evans and G. E. Meade, "Quaternary of the Texas High Plains," *University of Texas Publications, No. 4401*, pp. 485–507, December, 1945.

Butte II and the three lower levels at Ash Hollow Cave. These occurrences are relatively rare, but they offer some hope that the much-mentioned "gap" will eventually be filled. Finally, the Elm Creek Cycle seems to coincide very well with the Ceramic period recently established for the Central Plains. A beginning date of *circa* 500 A. D. for the building of LPT-O would agree well with present archaeological evidence, although the selection of a terminal date presents obvious difficulties.

These possibilities seem very attractive, but there remains much field work, by archaeologists as well as geologists, before a definitive statement can be made. This reviewer believes, however, that Lueninghoener's study substantially increases the probability that the task will finally be accomplished.

JOHN L. CHAMPE
Laboratory of Anthropology
University of Nebraska
Lincoln, Nebraska

NOTES AND NEWS

ARCTIC

Two expeditions will collaborate in studies on the Aleutian Islands this summer. The Harvard Aleutian Expedition, with support from the Viking Fund and the U. S. Navy, will study the biology of the living Aleuts and the archaeology of their predecessors. The center of operations will be Umnak Island. The party will be under the leadership of William Laughlin who will be particularly concerned with archaeology and with blood typing. The other members will be: Dr. Coenraad Frans August Moorrees, orthodontist, Forsyth Dental Infirmary; Dr. Fred Alexander, cardiologist, Massachusetts General Hospital; Stanley M. Garn, anthropologist, attached to both of the above institutions; Alan G. May, archaeologist; Charles I. Shade, archaeological assistant, Harvard University; and Gordon Marsh, linguist, University of Nevada. The physical anthropology division of the expedition will work for a time on Umnak, then move on to other islands, where clinics will be held for making medical examinations, blood grouping, and anthropological measurements. The archaeological group plan to excavate the old village site at Nikolski, Umnak Island. This is a rich site, with a twenty-five foot accumulation of stratified midden, representing the Russian, Aleut, and "pre-Aleut" periods of occupation. It was sampled by Hrdlička in 1938, when both Laughlin and May were members of his party. Although Hrdlička obtained many artifacts and skeletal remains, these were without stratigraphic data. The purpose of the present investigations is to establish the stratigraphic sequence at this site, and if possible at another site on the south end of the island. If time and opportunity permit, stratigraphic columns and pollen samples will also be secured from any sites accessible to places visited by the physical anthropological group.

Independent of, but cooperating with this expedition, will be a party from the Botanical Gardens of the University of Michigan, consisting of Theodore P. Bank and Robert Dorsett. They will make ethno-botanical studies in collaboration with Gordon Marsh, the linguist, and will also identify all botanical specimens obtained by the archaeologists. Even more interesting is their plan to make pollen analyses of material from strata at all the sites investigated by the archaeologists, as well as of bog materials near the sites.

While the Harvard Aleutian Expedition will return in September, Bank and Dorsett plan to continue their work through the winter and following summer, and hope to establish winter quarters by homesteading on the Aleutians. They will make detailed studies of the ecology of the area, in which attention will be given to the relationship between village sites and vegetation patterns. They also plan to make archaeological collections of such materials as may be obtained without disturbing unspoiled sites.

The National Museum of Denmark and the University of Alaska will resume this summer their fruitful collaboration in archaeology, which was begun at Point Hope in 1939. The main purpose of the present project is to make an archaeological survey of the Alaskan coast in the Norton Sound-Bristol Bay area. The party is expected to consist of the following: Dr. J. L. Giddings, Dr. Ivar Skarland, Mr. Wendell Oswalt, and Mr. Owen Rye of the University of Alaska; Dr. Helge Larsen and Dr. Erik Holtved of the Danish National Museum. Giddings will make a reconnaissance of Norton Sound, Oswalt will work from the mouth of the Yukon to the mouth of the Kuskowkim, and Larsen will investigate Bristol Bay. Giddings will also continue his dendrochronological studies, and for this purpose will make a trip to St. Lawrence Island. Holtved will take part in the archaeological work, although his main concern will be to record tales and songs from as many different groups as possible, primarily from the Kuskokwim and Bristol Bay Eskimo. The whole project is being financed by the Danish Expedition Fund and the Arctic Institute of North America.

The Andover-Harvard Yukon Expedition, financed by grants from the Peabody Foundation, Harvard University, the Viking Fund, the American Philosophical Society, and the Arctic Institute, will conduct an extensive archaeological, botanical, and geological reconnaissance of the region between Whitehorse and the Donjek River in Yukon Territory. The area was chosen on the basis of experience gained during a survey of the Alaska Highway in 1944 (see Johnson in AMERICAN ANTIQUITY, Vol. XI, No. 3, 1946, pp. 183–6) as one in which collaboration between these three disciplines might shed valuable light on early human occupation. It is especially hoped that the archaeological material previously secured in a buried layer of wind-blown soil may be augmented and its significance more fully understood. The party will consist of the following: Frederick Johnson and Elmer Harp, archaeologists; Dr. and Mrs. Hugh M. Raup and William Drury, botanists;

Dr. Leland Horberg, geologist; and Karl and David Raup, assistants.

Dr. Douglas Leechman of the National Museum of Canada will make an extensive archaeological reconnaissance in western Canada. Six weeks will be spent on the plains, about two weeks in southern Yukon Territory and Alaska, and about two months on the British Columbia coast.

At the invitation of the Canadian Government, Henry B. Collins, Jr. will conduct archaeological research on Cornwallis Island, where the recently established U. S.-Canadian Weather Station at Resolute Bay will be his headquarters. The archaeological work will be done for the Smithsonian Institution and for the National Museum of Canada, the latter to be represented by an assistant. Cornwallis Island lies northwest of Baffin Island and well north of the Magnetic Pole. No Eskimos have lived on it or on any of the other islands of the Parry group within historic times, but many ruins have been found there. Although the archaeology of the region is entirely unknown, it is expected that evidences of the Thule, and possibly of the Dorset culture will be discovered.

Dr. Hans-Georg Bandi of the Ethnographic Museum of Basel is reported to be planning archaeological research on Clavering Island, northeast Greenland. This is the island where Dr. Helge Larsen conducted extensive excavations at the very large site of Dødemandsbugten, "Dead Man's Bay" (cf. Larsen in *Meddelelser om Grønland*, Vol. 102, No. 1, 1934). (*F. de L.*)

SOUTHWEST

The 1948 Southwestern Anthropological Field Conference will be held at the University of Arizona Archaeological Field School at Point of Pines, on the San Carlos Indian Reservation, in Arizona. The dates are August 24th through 26th. While the group discussions will center about archaeological problems, efforts will be made to keep the scope of discussion broad enough to hold the interest of those not primarily engaged in this field, and all anthropologists are invited. The University, through the courtesy of Viking Fund, Inc., will furnish board and such lodging in tents (capacity about 65) as will be available. Participants are requested to bring small tents if possible, and their own bedrolls. Inquiries and suggestions for the agenda will be welcomed. Address Dr. Emil Haury, University of Arizona, Tucson, Arizona.

The University of Arizona Archaeological Field School will be in session from June 26th to August 20th with approximately twenty students. Dr. Edward H. Spicer has been awarded a grant from the Viking Fund which will enable him during the summer to complete two extensive manuscripts on the Yaqui Indians.

Mrs. Clara Lee Tanner will spend part of the summer in Santa Fe, New Mexico, on an Indian Arts Fund Fellowship. She will engage in studies of modern Southwestern Indian painting, a project which will also be continued through the next academic year. Mrs. Tanner has been given a leave of absence from the University of Arizona to pursue this project.

Harry T. Getty and Bertram S. Kraus will be working on their respective problems—"Interethnic Relationships in the Community of Tucson" and "Constitutional Typology and Race, a Study of Somatotypes among Japanese of Northern Honshu." The Department of Anthropology of the University of Arizona, as authorized by administrative action, will offer the Ph.D. degree in Anthropology beginning in September, 1948.

The year 1948 marks the twentieth anniversary of the founding of the Museum of Northern Arizona, concurrently with its nineteenth archaeological expedition. Dr. Harold S. Colton, Director of the Museum, and Dr. S. Watson Smith, director of the expedition, will begin field work on June 21st. Miss Katherine Bartlett, Curator of Anthropology of the Museum, will supervise the laboratory work. Eight students and several Hopis will constitute the personnel of the expedition. The project includes the study of the Sinagua-Kayenta frontier near Flagstaff at about 1150 to 1200 A.D., and the excavation of several small Pueblo III sites on the Wupatki National Monument near the Citadel, and several near Winona, east of Flagstaff. The expedition will spend the first six weeks on the excavation, and an equal period at the Museum studying the material and preparing a report. Dr. Frederica de Laguna and Dr. Gladys Reichard, Research Associates of the Museum, will spend the summer at Flagstaff.

The Amerind Foundation of Dragoon, Arizona has been operating a small field project on the Babocomari Wash, a small stream which enters the San Pedro River near Fairbank, Arizona. Charles Di Peso is in charge of the work. The significant features thus far are house types, large and shallow fire pits, and a very few cremation pits. One of the latter produced upward of 5000 very small stone beads. The field work will continue until the middle of June.

The staff of Gila Pueblo, Globe, Arizona, has been augmented by the addition of John S. MacSporran, Treasurer and General Assistant, and Miss Ruth Agawa, Laboratory Assistant. The Pueblo's winter activities included the dating of wood specimens for F. C. Hibben of the University of New Mexico and R. Burgh of the University of Colorado, as well as the restoration, classification, and study of material gathered at Mesa Verde and at a ruin in the Apache National Forest by Dr. Deric O'Bryan. On May 1st Dr. O'Bryan began another six weeks at an Apache National Forest ruin, with the assistance of Mr. MacSporran, in an effort to date the beginning of St. Johns Polychrome.

During the balance of the summer Dr. O'Bryan will continue his excavations at Mesa Verde National Park, working in ruins somewhat later in age than those excavated last year. The Developmental Pueblo ruins excavated in the Park by O'Bryan in 1947 will be opened to the public this summer, according to Don Watson of the National Park Service. These comprise three small mesa-top villages covering a time span of about two centuries and are of types not previously excavated in the park.

At the Chicago Natural History Museum, Drs. Paul Martin and John Rinaldo have been analyzing the results of last summer's excavations in the Mogollon area of western New Mexico. The report on this work is now in press and will probably be out this year. Dr. George Quimby has been preparing archaeological reports on work which he undertook in the lower Mississippi valley. During the summer, Dr. Martin and Dr. Rinaldo expect to return to

western New Mexico and exacvate more sites belonging to the San Francisco, Three Circle, Reserve, and Tularosa phases.

During the spring, the anthropology staff of the Chicago Natural History Museum, in cooperation with Dr. Fred Eggan of the University of Chicago, has participated in a seminar on problems in Southwestern archaeology and ethnology. Special attention was paid to the relationships among the archaeological and ethnological cultures. Clarification of these problems involves consideration of the development and interrelations of the major archaeological cultures, a survey of the historic culture types, and an intensive analysis of the continuity between the two.

After working over the collections from earlier work at the Turner site, near Cisco, Utah, Marie Wormington of the Colorado Museum of Natural History plans to resume the clearing of the remainder of the village during the summer. A paper relating to a proposed revision of Yuma point terminology and a third, enlarged edition of "Ancient Man in North America" also are current projects of the Museum. In addition to research, Miss Wormington has been teaching a course in Southwestern Archaeology at the University of Denver.[1] Some of her students have been assisting her in surveying some archaeological sites threatened by the Cherry Creek dam project near Denver.

The winter's program of the Denver Art Museum was devoted chiefly to the preparation of new exhibits, catalog checking, and the acquisition of Pacific material. The museum director, F. H. Douglas, during the spring semesters, taught courses in material culture both at the University of Denver and the University of Colorado.

As announced heretofore, the Department of Anthropology of the University of Colorado is sponsoring two field programs. One of these is supervised by Robert H. Lister and Robert F. Burgh and involves five weeks of field work in archaeology in the Yampa Canyon, Dinosaur National Monument, Colorado. The University of Colorado Museum is cooperating in the venture. The second program, in charge of Dr. Omer Stewart, consists of five weeks of field work in social science at the ethnically-mixed community of Ignacio, Colorado. During the past winter Burgh continued archaeological reconnaissance in reservoir areas east of the continental divide on the Colorado-Big Thompson project. The anthropology hall of the University Museum was recently completely remodeled. Exhibits now include ethnological displays, as well as the featured Southwestern archaeological material collected by Earl Morris over a period of years. A publication *Series in Anthropology* was recently established by the University and one manuscript submitted is Burgh's "Yampa Canyon Archaeology."

In Santa Fe, the Indian Arts Fund, under the chairmanship of Dr. Walter Taylor, Jr., has offered several Summer Fellowships for the purpose of getting the collections of the Fund known in the anthropological and art worlds, and providing the means for their study. It is planned that these Fellowships (of $200.00 each) will continue each summer and will be increased in number. Dr. Taylor has, in addition to his Indian Arts Fund activities, been engaged in an intensive study of his Coahuila cave materials —a study which he plans to complete by the end of the year.

The anthropology field sessions of the University of New Mexico include an advanced session in central Utah, specializing in archaeology and ethnology, under the direction of Dr. Florence Hawley. Eight students will participate. The general field session this year will be held in Albuquerque and will be concerned with the excavation of two archaeological sites near Albuquerque. Stanley Stubbs, of the Laboratory of Anthropology and Museum of New Mexico, will be in charge of one of the excavations; Fred Wendorf of the University of Arizona will be in charge of another; and Thomas Mathews, of the University of New Mexico, will direct the laboratory work. The regular summer courses on the campus will be taught by Paul Reiter. In addition, the university is either sponsoring or cooperating in five other field projects, which will be summarized in the fall.

Within the past year, an independent Department of Anthropology has been created at the University of Utah. Dr. E. Adamson Hoebel, formerly of New York University, has been appointed Chairman of the Department. In instruction, Dr. Hoebel will deal with anthropological theory, culture and personality, and cultural anthropology; Dr. Charles E. Dibble will stress Central and South American ethnology, archaeology, and linguistics; and Elmer R. Smith will specialize in the field of inter-cultural relations, cultural anthropology, and Southwestern archaeology, with emphasis on ancient cave cultures of the Great Basin and the northern periphery. During the winter and spring months, Mr. Sydney Jameson has been studying the archaeological material obtained from excavations on Stansbury Island in the Great Salt Lake. Effective in the spring, Dr. Dibble has been released from half of his teaching duties for research necessary to the translation of Sahagun's *Historia general de las cosas de Nueva España* as found in the Florentine Codex. This project is undertaken in cooperation with A. J. O. Anderson, Department of History, Museum of New Mexico. The total project is expected to take five years.

Prof. F. C. V. Worman, of the Department of Social Sciences of Adams State College, Alamosa, Colorado, has announced a summer field session in archaeology, from June 21 to August 27, to be located at Bandelier National Monument, west of Santa Fe, New Mexico. The session is announced as the first of a five-year program of archaeological research to be carried on at this location. The enrollment is limited to fifteen students. Under the direction of Dr. Robert E. Bell, the University of Oklahoma has also announced a field session in archaeological research, in conjunction with the University of Oklahoma Museum. The location of this research is the Scott site on Fourche Maline Creek, in eastern Oklahoma.

The summer of 1948 sees the beginning of the field work of the Upper Gila Expedition of the Peabody Museum of Harvard University. Excavations relative to early man will be undertaken from June 10 through September 12, in the San Augustin Plains area, under the direction of Herbert W. Dick, graduate student at Harvard. Because of a belief

[1] For further information concerning activities at the University of Denver, see the Plains section. *Editor.*

in the scientific value of the project, the Anthropology Field Sessions of the University of New Mexico is cooperating.

Dr. J. O. Brew, formerly Curator of Southwestern Archaeology at the Peabody Museum of Harvard University, will become Director of the Museum on July 1st. Dr. Brew succeeds Professor Donald Scott, who retires on this date. Professor Scott, along with his colleagues, will long be remembered for his active support of the Museum's extended field work in the Southwest and many other parts of the world, and particularly for his share in the vastly enlivened publication program of the Peabody Museum. All of Professor Scott's friends and former students will be aware that his retirement is, in large part, a formality, and that his assistance with archaeological research and his studies of petroglyphs will continue for years. (*P.R.*)

PLAINS

At the University of Texas, according to Alex Krieger, T. N. Campbell, Chairman of the Department of Anthropology, has continued work on his publication concerning Texas coastal archaeology. He hopes to make investigations in the field during the first half of the summer. During the spring semester he and J. Charles Kelley conducted a student excavation program in a rock shelter near Austin. Kelley has spent most of his available time in building new displays in the Anthropology Museum, concentrating on the demonstration of research methods. Lois Kelley has completed two magnificent paintings for the museum, one an exact reproduction of part of the Altamira Cave paintings, the other a similar reproduction of presumably ceremonial figures from a western Texas shelter wall. In July and August, Kelley plans to conduct a reconnaissance of the Rio Grande valley between El Paso and Presidio. H. C. Taylor, advanced student in the department, plans a summer reconnaissance in the Pecos River—Rio Grande confluence area, working on both the Texas and the Mexican sides. Plans are also under way for the annual meeting of the Texas Archaeological and Paleontological Society, to be held in Austin in October.

Alex Krieger, University of Texas archaeologist, continued publication work during the winter, principally on the Davis mound site in eastern Texas. Several short papers were also prepared, and during the spring an article on "early man" problems, together with the tentative program of the Sixth Plains Conference were issued in the Plains Conference *News Letter*. Letters on the River Basins Survey work were sent to all Texas Congressmen, and various amateurs and archaeological societies were also urged to write. On April 1, Krieger received a $5,000 grant from the Viking Fund, Inc., to conduct excavations at the Battle Mound site on Red River in southwest Arkansas. The field work is being directed by Mr. M. P. Miroir of Texarkana. Since the mound lies on an old channel of Red River, and its base has been buried by silting of the flood plain, an interesting geological problem is also presented. Two nearby cemeteries are being explored, and the mound slopes are being followed downward in an attempt to locate the sub-mound village. The cultural affiliations of the great mound, 592 feet long with platforms at different levels on all four sides, have not yet been determined. A contour map of the entire site is being prepared.

During the winter and spring, R. L. Stephenson of the River Basins Survey conducted field work in eastern Texas, first in the "Dam B" basin on the Neches River, then in the very large McGee Bend Reservoir on the Angelina River east of the Neches. On April 20 he returned to Austin to analyze his results.

The Dallas Archaeological Society (R. K. Harris, president) has been doing important work for two years in recovering materials from reservoir projects north and east of Dallas. A house outline in a non-pottery site has been completely cleared and accurately recorded. The Houston Anthropological Society (R. B. Worthington, president) has been continuing the exploration of sites in reservoir basins in the Houston area.

Grayson E. Meade and Glen L. Evans of the Texas Memorial Museum, Austin, continued work in the spring on the deep deposits in Montell shelter, 40 miles north of Uvalde in southwestern Texas. Artifacts and flint chips have been met many feet down in the 15-foot layer of decomposed limestone which underlies a 4-foot layer of "burnt-rock midden." This site promises to yield crucial information on the little-known but undoubtedly early horizon which precedes the typical Edwards Plateau culture.

E. T. Hall, University of Denver, writes that his Department has under way the following research projects: acculturation studies of American Indians resident in Denver; development of audio and visual aids for classroom use in cultural anthropology, by F. H. Douglas, E. T. Hall, and Miss Arminta Neel; archaeological survey of the high western plains, by A. M. Withers. During the coming summer, Withers will conduct an archaeological survey of east-central Colorado under the sponsorship of the River Basin Surveys. Dr. Hall will leave the University of Denver to accept a position next year on the Social Studies Faculty of Bennington College, Bennington, Vermont.

At the University of Kansas, Carlyle S. Smith replaced A. C. Spaulding as Assistant Curator of Anthropology in September, 1947. Smith has carried on survey work in Kanopolis Reservoir near Ellsworth, Kansas, in preparation for eight weeks of intensive excavation to be conducted there in the summer of 1948. Preliminary investigations by the University and the River Basin Surveys reveal the presence of sites attributable to Woodland, Upper Republican, and Great Bend cultures.

The University of Kansas Museum of Natural History is recipient of an extensive collection of archaeological material presented by Mr. Floyd Schultz of Clay Center, Kansas. The material was collected by Mr. Schultz along the lower valley of the Republican River, from sites attributable to the Upper Republican and Hopewellian cultures. All of the material is documented, catalogued, and has been prepared by the donor, and it represents an important contribution to Great Plains archaeology.

A new combination office and laboratory has been built contiguous to the previous archaeological storeroom. Additional new facilities include laboratory equipment, excavating tools, camping equipment, and a station wagon. Work

immediately in prospect includes analysis and publication of the data gleaned from the Schultz collection and the field studies at Kanopolis.

From Carl H. Chapman, University of Missouri, comes word that reconnaissance of water-control reservoir areas has been accomplished in large part by calling upon non-professional archaeologists for aid in the field. The investigations have been kept under control by the organization of local chapters of the Missouri Archaeological Society. These chapters have taken the responsibility of reporting locations to the state Society, and all the investigations have been in close cooperation with the University, which acts as a directive agent and clearing house for information and projects. The University and the Society are cooperating with the Smithsonian Institution wherever Federal water-control projects are involved.

At Clearwater Reservoir during March a survey by the University, the Archaeological Society, and the Academy of Science of St. Louis disclosed some thirty-five sites; only about half the future pool area was investigated. Pottery was found on a few of these locations; it was predominantly shell tempered, with cord-roughened exteriors and flat-based vessels. Associated artifacts include full-grooved axes, mortars, pitted hammerstones, small triangular and stemmed projectile points, large crude stemmed points, and a shell-tempered clay pipe with flat base and projecting stem. The pottery sites here may be of fundamental importance in tracing the influence of Mississippi people upon Woodland cultures of the region.

Other projects included a survey on Little North Fork River, a part of the Bull Shoals Reservoir, and a survey of the Waco Reservoir, where fourteen sites were located. From June 8 to July 30, the University of Missouri will conduct a field session in archaeology. Surveys and excavations will be made at Clearwater Reservoir on Black River, at the edge of the St. Francois Mountains, in the Bull Shoals Reservoir area in southwestern Missouri, and at sites in Vernon and Saline Counties.

The Nebraska State Historical Society will carry on field work in the Medicine Creek Reservoir area of southwestern Nebraska. Primary emphasis will be on excavation and testing of Upper Republican and other sites lying near the dam site. This work will be under direction of Mr. A. T. Hill, and will be a continuation of excavations by the same organization last summer, when several earth lodges were uncovered and extensive collections made. The society is cooperating closely with the River Basin Surveys in this work, as well as in the subsequent analysis of the findings.

Dr. John L. Champe announces plans for a University of Nebraska Laboratory of Anthropology summer field session in the Harlan County Reservoir area in southern Nebraska. Sites to be investigated include one of the Dismal River complex, and another whose cultural affiliations and nature are still undefined. This work is also in cooperation with the River Basin Surveys.

W. H. Over reports that activities at the University of South Dakota Museum during the past few months have been confined largely to analysis of materials recovered from three sites partially excavated during the summer of 1947. A report has been completed on the work at the La Roche site in southeastern Stanley County; release of the publication is scheduled for the end of April. The manuscript of a preliminary report on the Thomas Riggs site in Hughes County has also been finished, but publication plans are uncertain.

Plans for the 1948 field season are still uncertain. Tentatively, a curtailed program of field investigations is contemplated along the Missouri River, possibly in the vicinity of Pierre. In the event that these plans materialize, the field work will be under the direction of Mrs. Edith George of the South Dakota Historical Society.

Dr. Gordon Hewes, University of North Dakota, writes that the winter months have been devoted in part to analysis of collections made last summer. The weather has prevented reconnaissance of the Baldhill Dam area, where reservoir construction is now under way. The University's Department of Sociology and Anthropology plans a summer field session, June 21 to July 31, which will include excavation of sites along the Cheyenne River in the area to be flooded by the Baldhill Reservoir. The work will be under the direction of Dr. Hewes, and will be in cooperation with the North Dakota State Historical Society.

For the Missouri River Basin Survey, I must report that field work got underway again on March 29. With power machinery and labor furnished by the Bureau of Reclamation, Mr. M. F. Kivett and George Metcalf began excavation of Upper Republican village sites lying on the west abutment of Medicine Creek dam, now under construction. By late April, seven earth-lodge sites, six small midden areas, and miscellaneous other features had been worked out. Approximately four acres of the topsoil had been removed by stripping; so an accurate plan of the village arrangement will be secured. Large quantities of pottery, stone, bone, and shell artifacts and other materials have been recovered. This, the first large scale application of power equipment to a specific archaeological project in the Missouri Basin, seems to indicate that on certain sites, at least, the procedure can be used to great advantage.

For the most part, the Basin Survey staff has been busy in the lab all winter, preparing reports on the various field operations of last year. Reports are well advanced on excavations by Bliss and Hughes at Birdshead Cave in the Boysen Reservoir, Wyoming; by Cooper on various sites in Fort Randall Reservoir, South Dakota; and by Kivett on a prehistoric ossuary in Harlan County Reservoir. Mimeographed reports on survey activities have been issued frequently throughout the winter to the National Park Service, for distribution to the construction agencies and other interested parties. Ethnohistorical files have also been started for use in connection with the surveys.

During the next few weeks or months, it is expected that field work will be resumed by the Basin Survey on several fronts. In addition to continuing the Medicine Creek operations, work will be done at Angostura Reservoir in southwestern South Dakota, at Heart Butte Reservoir in North Dakota, and probably elsewhere. Uncertainty over Congressional action has delayed the final settlement of summer field plans. (*W.R.W.*)

NORTHERN MISSISSIPPI VALLEY

For the past three summer seasons the Indiana Historical Society has experimented with the use of students from Indiana University in exploratory work at the Angel site. This has proved so satisfactory that the cooperating agencies, namely, the Indiana Historical Society, Indiana University, and the Indiana Department of Conservation are making provision for larger groups. Six buildings are being erected at the site for use as dormitories, mess hall, and laboratory. A field course, Anthropology 209, for which Indiana University will allow ten credits, is being offered to graduate and undergraduate students specifically interested in archaeology. The full summer will be devoted to the study of field methods and techniques and actual excavations in the village at the Angel site. Subsistence will be furnished by the Indiana Historical Society to those students accepted. (Taken from *Central States Bulletin*, Vol. 2, No. 2.)

According to Thorne Deuel, the Illinois State Museum and the Department of Anthropology, University of Chicago will again conduct joint operations on and near Starved Rock and Utica, Illinois. The Division of Illinois Parks of the Department of Public Works and Buildings will cooperate again this year as last in furnishing camping quarters and part of the labor. An attempt will be made to discover the remains of Fort St. Louis on the Rock with a view to its future restoration by the Illinois Parks Division. Drs. John C. McGregor and Kenneth Orr will be in charge.

The Archaeological Survey of Illinois has to date information from 362 sites from 44 counties in Illinois. This has been furnished chiefly by members of the Illinois State Archaeological Society.

The Museum of Anthropology of the University of Michigan will have two field parties this summer. One will be under Dr. Emerson F. Greenman in the Manitoulin District of Georgian Bay, working primarily on Paleo-Indian sites associated with raised beaches. This program is being conducted as part of the Summer Session of the University of Michigan and is open to students registered for credit at the University. The second excavation program will be in the southwestern corner of Michigan a short distance west of Niles, where a site locally called Moccasin Bluff, which has produced Hopewell, Fisher, Blue Island, and Late Woodland material, will be excavated. This excavation will be under the general direction of Dr. James B. Griffin and under the direct supervision of Hale Smith and Lynn Howard.

The University of Michigan's spring dig was again at the Snyders site in Calhoun County, Illinois. This resulted in further confirmation of the developmental sequence within Illinois Hopewell and furnished additional evidence on other little-known facets of this culture in the Central Mississippi Valley area. The field party made numerous stops on its way north and spent one evening in Peoria examining the Schoenbeck and Stone collections through the courtesy of Mr. and Mrs. Schoenbeck and Judge Stone.

Richard G. Morgan, assisted by Raymond S. Baby, who recently joined the staff of the Ohio State Museum, is excavating a Hopewell Mound in Ross County, Ohio. Present plans call for excavation later this summer near Wilmington of a mound which will be leveled as a hazard to navigation in the Cowan Creek Reservoir.

The Wisconsin Archaeological Survey will initiate its excavation program in western Wisconsin opposite Red Cloud, Minnesota, in an extensive group of effigy and conical mounds. It is hoped that these excavations will contribute to the problem of the relationship between the Effigy Mound and Hopewell cultural groups and their position in relation to the Oneota Aspect in Wisconsin.

According to Robert R. Jones, the anthropology course offered by the University of Wisconsin Extension Division, at some of its Extension Centers last year, included some elementary work in field archaeology. Lectures were followed by 16 mm. movies of actual work in the field, in slow motion, and finally, by week-end field parties led by their instructor, Robert R. Jones.

The first was by the students of the New Richmond center. A site near Star Prairie was excavated with negative results. The second, by the students of the Ladysmith center, dug into one of the group of three unreported mounds on the farm of George Nater, south of Bruce, Wisconsin on the north bank of Soft Maple Creek. A few yards north of this group, a village site was found. A layer of burned earth was encountered at a depth of 24" to 25" near the 10' line, and a little left of the axis of the mound. This yielded a Folsomoid point, fluted nearly to the point on one side and about halfway on the other. From this same undisturbed layer, and in close proximity, fragments of Early Woodland pottery and of quartzite projectile points were found. This material is similar to the stonework found on the adjacent village site. There, points of a shape recalling Folsomoid, but unfluted and of much coarser workmanship, were found. The fragments of bone found were almost completely disintegrated. Burials appear to have been scattered secondary in type. All three mounds had been badly pitted by lumberjacks about forty years previously.

The third and fourth week-end trips were by the Rice Lake and the Spooner center groups respectively. Both parties dug in the extensive group of mounds located on the Caulkins farm, three miles north of Chetek. Two mounds were dug into. The first yielded one flint point of stemmed type. The second mound yielded a disarticulated burial containing parts of two skeletons. This was found in a floor pit near the center of the mound late on the second day of digging. It, too, was of Woodland type. A detailed report of this work, with the needed charts and photographs will appear in the forthcoming spring issue of the *Wisconsin Archaeologist*. (*R.G.M.*)

NORTHEAST

The following statement of projected field work comes from Douglas S. Byers of the R. S. Peabody Foundation, Phillips Academy, Andover, Massachusetts:

"During the summer of 1948, the Robert S. Peabody Foundation will have two expeditions in the field. One, sponsored jointly by the Robert Abbe Museum and the Robert S. Peabody Foundation, will continue excavations on a small island in the Union River at Ellsworth Falls, Maine. Preliminary work there has disclosed what appear

to be three periods of occupation, the upper two related to one another, but the lowest, apparently, in a very different tradition. It is hoped that further work there will contribute greatly to our knowledge of the sequence of cultures in the region.

"The second expedition will be sponsored jointly by Harvard University and the Foundation, and will take the field in late May as the Andover-Harvard Yukon Expedition. Supported by grants from both institutions as well as The Viking Fund, The American Philosophical Society, and the Arctic Institute, it will search for further evidence of man and will also gather botanical and geological data from the region in which a survey was made in 1944.[1]

"The Foundation has also given support in an amount equal to a grant from The Viking Fund, to Messrs. Edward and Murray Rogers, for an archaeological survey of the central part of the Province of Quebec, in territory through which a preliminary reconnaissance has already been made."

In Connecticut, according to Dr. Irving Rouse of the Yale Peabody Museum, the Museum and the New Haven Chapter of the Archaeological Society of Connecticut will this summer jointly excavate a shell-heap site of the Coastal culture on Grannis Island in New Haven Harbor. The work will be under the leadership of Howard R. Sargent, a student of anthropology at Yale University. Two other state chapters will also be active in the field, the Danbury Chapter on a site near New Milford and the Windham County Chapter on the Fraser site near Danielson. In addition, Mr. William S. Fowler of the Attleboro Museum will dig a rock shelter at Barkhamsted in collaboration with Dr. Rouse, and Mr. G. D. Pope, Jr., a graduate student at Yale, will excavate at the E. D. Pray site in Killingly.

The Rochester Museum of Arts and Sciences will have a small party in Ontario during a part of the summer, under the direction of Dr. William A. Ritchie. Beginning on the Bay of Quinte, the Trent Waterway will be searched to or beyond Rice Lake for sites which will (1) throw possible light on still earlier stages of the Owasco culture than any yet discovered in New York, and (2) afford a fuller understanding of the Point Peninsula manifestation, which in New York appears to be peripheral to a major center in lower Ontario.

Dr. Ritchie has recently completed the typing of New York pre-Iroquoian pottery which was started with Richard S. MacNeish in the fall of 1947. A joint report on this work will soon be prepared.

A striking discovery made in northern New Jersey by Dr. Lewis M. Haggerty of Hackensack, has been reported by Edmund S. Carpenter of the University of Pennsylvania. To date eleven graves have been opened which contained cremated, flexed, and secondary burials of adults and children. Attendant grave goods amply link the remains to the Middlesex Focus of the Vine Valley Aspect. Present were blocked-end tubes; boat-stones of stone and copper; rectangular gorgets and pentagonal pendants; a steatite cone; thin rolled sheet copper beads; a rectangular copper awl; a copper celt; conch columella shell beads; large stemmed flint blades; corner-notched, side-notched, and pentagonal-shaped projectile points; stone celts; and other articles. Red ocher occurred in at least one of the burials.

Mr. John Witthoft has recently been appointed Assistant State Anthropologist of the Pennsylvania Historical and Museum Commission and will devote a part of the summer to a reconnaissance of eastern Pennsylvania, after which he will resume excavations on Unami sites along the Delaware on a further grant from the Indiana Historical Society.

A New Hampshire Archaeological Society was formed in Manchester, New Hampshire, on Saturday, November 29, 1947. Membership at the first meeting numbered 45. A constitution was adopted and the following men were elected as officers:

President: Laurence M. Crosbie, Exeter, N. H.
Vice Presidents: Frank O. Spinney, Director of Manchester Historic Association; James T. Schoolcraft, University of New Hampshire; Henry Phillips, Jr., Exeter.
Sec'y-Treas.: Elmer Harp, Jr., Dartmouth College Museum, Hanover, N. H.

The New Hampshire Society, aside from acting as a coordinating center for interested people throughout the state, expects to develop a program of active field research and hopes thereby to help fill some of the blank spots in the prehistory of the Northeast. (*W.A.R.*)

SOUTHEAST

There has been established recently a new Department of Anthropology and Archaeology at the University of Georgia with A. R. Kelly as Chairman. Dr. Antonio J. Waring, Jr., of Savannah, has been appointed Research Associate in Archaeology and will collaborate in the preparation of an exhibit at the University on the art and symbolism of the Southeastern Indian tribes with particular reference to the so-called "Southern Cult." The new department has received a grant-in-aid from the Carnegie Fund to prepare the exhibit.

The Smithsonian Institution and the University of Georgia have a cooperative agreement in connection with the River Basin Survey of archaeological sites along several major drainages of Georgia. At present the Smithsonian is conducting a survey of the Clark Hill Dam Reservoir on the Savannah while the University of Georgia is surveying sites on the Lower Flint and Chattahoochee rivers. The Department of State Parks of Georgia has allocated funds for a twelve-week survey of Kolomoki Mounds State Park in southwest Georgia. The University will have general supervision of the archaeological work which will provide data for the preparation of a culture map that will guide future developmental planning of the area.

The University of Florida is expanding its teaching in anthropology with the appointment of John M. Goggin, who has just received his doctorate at Yale, as Associate Professor. The Department of Sociology now becomes the Department of Sociology and Anthropology. Plans call for a development of courses which will eventually lead to an anthropology major. Archaeological research is also contemplated, particularly in the Central Florida region around the University where cultural remains ranging possibly from Paleo-Indian to Spanish mission sites are found.

[1] Further information concerning this expedition is contained in the section on the Arctic. *Editor.*

The University's field program will be integrated with those of other state agencies.

The Archaeological Survey of the Florida Park Service has transferred its headquarters from Sebring to Gainesville where it can co-operate more readily with the Florida State Museum and the University of Florida. Hale G. Smith has resigned as Assistant Archaeologist, Florida Park Service, in order to complete his academic work. Recently released was the first bulletin of the Florida Park Service, "The Goodnow Mound, Highlands County, Florida" by John W. Griffin and Hale G. Smith. Tentative plans for the summer call for excavations in the region of Fernandina in extreme northeastern Florida. The field party will work out of Ft. Clinch State Park.

From Robert Wauchope, of the Middle American Research Institute at Tulane University, comes word of the enlargement of the Institute staff. Three part-time research associates have been added: Arden R. King, Research Associate in Anthropology; William J. Griffith, Research Associate in History; and John Biesantz, Research Associate in Sociology. These new staff members also hold positions in corresponding teaching departments of the College of Arts and Sciences, Newcomb College, and in the Graduate School.

The Institute has published two monographs this year: "Physical Anthropology of a Mexican Population in Texas" by A. R. Kelly, and "Excavations at Zacualpa, Guatemala" by Robert Wauchope. Number 5 of the *Philological and Documentary Studies*, "Landivar's Rusticatio Mexicana," translated by G. W. Regenos, is now in press. Several other shorter manuscripts have been completed for the *Record Series* and the *Miscellaneous Series*.

John L. Cotter, Archaeologist, National Park Service, reports progress on the Natchez Trace Parkway Archaeological Survey. The nine-month campaign at the Bynum site in northern Mississippi carried through the winter and spring with complete excavation of two mounds and systematic testing and partial excavation of an extensive adjoining village site. The field project here will terminate in May with excavation of a third mound.

Principal features of the two mounds now completed were:

Mound A, dome-shaped earth mound erected over a central burial feature containing a pair of massive logs laid parallel, seven feet apart, on a burnt floor. Between these logs lay an extended principal burial with a pair of copper spools on each wrist. Associated were two flexed burials of adults and one child. A circular pattern of single post molds precedent to the mound were situated beneath the northeast quadrant.

Mound B, a central pit feature containing on a burned floor one extended flesh burial and three cremations with a fourth cremation in a subpit. Accompanying grave goods were thirty polished greenstone celts, two pairs of copper spools, and two caches of flaked spear points. Large, deep molds extended through the pit floor.

The village site featured a series of single, circular post-mold patterns ranging from 35 to 70 feet in diameter. Unassociated, but in the village area, was a single 14-foot pattern of small shallow molds. Several thousand apparently random post molds were scattered over the village area, and two concentrations of flexed circular pit burials were located outside of pattern features.

In peripheral portions of the village were located two series of probable late eighteenth century Chickasaw burials, flexed, in rectangular graves, with beads and cups and spoons, a silver gorget, copper bells, and miscellaneous articles. A principal historic burial was that of a tall male who wore a silver crown and lay with a flint lock gun assembly, metal tomahawk pipe, shell gorget, and miscellaneous trade objects.

At headquarters of the Natchez Trace Parkway, Tupelo, Mississippi, a laboratory in charge of Archaeologist John M. Corbett has processed all field materials currently with the excavation. Preliminary studies of all artifacts are now under way. After a two-month interval for the preparation of a report on the Bynum site, field operations will be transferred to the Emerald Mound site near Natchez, Mississippi.

Recent visitors at the University of Kentucky have been W. E. Ekblaw, Geography Department, Clark University, and Clyde Kluckhohn, Anthropology Department, Harvard University. Professor Ekblaw gave a series of lectures on the Polar Eskimo to the faculty of the Anthropology, Geography, and Sociology departments. Dr. Kluckhohn conducted a series of conferences over a three-day period on the Navajo. The Eskimo and the Navajo, among other peoples, are considered in a course given jointly by the three departments.

The summer field season will be devoted to excavation of three sites in the Wolf Creek Dam Reservoir in southern Kentucky. It is planned to explore two large village sites and a small earth mound. Surface collections indicate the sites to be Woodland and Mississippi. It is hoped that some contact sites may be revealed in the area.

The Alabama Museum of Natural History will excavate the Upper Creek town of Coosa this summer. This site is located on the Coosa River near Childersburg in east-central Alabama. Dr. John R. Swanton states that Coosa is one of the best documented sites on De Soto's route through the southeastern United States. De Soto visited the town in 1540 and at that time Coosa was the strongest town of the Upper Creeks. Members of the De Luna expedition visited the town nineteen years later. Coosa continued to be occupied until at least 1799, and was abandoned sometime between 1799 and 1832.

David L. DeJarnette, Curator of the Alabama Museum of Natural History, and Steve B. Wimberly, Archaeologist at Mound State Monument, will supervise the Coosa excavations. J. C. Harrington is returning to Fort Raleigh, North Carolina to continue excavations for the National Park Service. (*W.G.H.*)

SOUTH AMERICA

New World archaeologists, particularly Peruvianists, were saddened by the recent death of one of Peru's leading scholars, Dr. Julio C. Tello.[3] Dr. Tello was Director of the National Museum of Archaeology and Anthropology and Professor of Archaeology at the University of San Marcos. He has been succeeded as Director of the Museum by Dra. Rebecca Carrión Cachot, for many years Assistant Director. In the university it is reported that Dr. Fernando

[3] See pp. 50–6 above. *Editor.*

Márquez Miranda, the distinguished Argentine archaeologist, will take over Dr. Tello's post.

Sr. Rafael Larco Hoyle, accompanied by his family, has been making an extended trip through the United States since September of last year. Sr. Larco has stopped in Washington and New York to visit North American colleagues and study museum collections. He is now touring the Midwest and West.

Dr. Hans Horkheimer, formerly of the University of La Libertad, Trujillo has gone to the University of Arequipa to give a series of conferences in prehistory.

Mr. Richard Schaedel, graduate student of the Department of Anthropology, Yale University has recently communicated concerning his own and other researches in Peru and Bolivia. During the latter part of 1947 Schaedel, accompanied by his wife, conducted a survey of highland stone sculpture. He has recently completed a jeep trip through the south and central Peruvian sierra, stopping en route to cross the Bolivian line and visit Tiahuanaco and La Paz.

From the University of San Marcos, students of Dr. Jorge C. Muelle have been carrying on stratigraphic test and cemetery excavations at Ilo. In the south, Dr. Morante, of the University of Arequipa, has recently published an article describing his work at the Gloria Leche Plant site near Arequipa. Distinctive tombs at this location contained Churajón style ceramics. At Puno, Sr. Franco Inojosa is preparing an archaeological map of the immediate region and a summary description of the sites located.

In La Paz, Sr. Max Portugal is continuing with research and writing on Bolivian altiplano sites at Copacabana, Huata, and Jesus de Machaca. In one location he has isolated a new style of black incised ware. Portugal has also discovered a semi-subterranean temple at Tiahuanaco which has interior walls decorated with geometric and anthropomorphic figures. An item of special interest from this area concerns a new and accidental discovery at Tiahuanaco. After the earthquake of 1947 a monolith, heretofore unknown, was uncovered. It is reported to be in the same style as the Monolito Bennett and the famous Gateway of the Sun.

A French Mission has been represented in Peru in recent months by M. Henry Reichlin. According to plans Reichlin hopes to carry out excavations around Cajamarca and Chachapoyas.

The following archaeological note from Popayán, Colombia was submitted by Dr. John H. Rowe. Dr. Rowe has been employed by the Institute of Social Anthropology of the Smithsonian Institute for the past year. He has been stationed at the Universidad de Popayán.

"In September, the Instituto Etnológico of the University of the Cauca and the Institute of Social Anthropology of the Smithsonian Institution sponsored an ethnographical field trip to the Indian community of Guambía on the upper Piendamó River in the Central Cordillera. In addition to the studies of modern life which were the special object of the trip, a start was made toward an archaeological survey of the area, with rather unexpected results, as previous indications had suggested that the area was not particularly promising.

"Thirteen sites were visited, mostly small ones, and surface collections were made at all of them. They are all habitation sites. Some are groups of house platforms (i.e., artificially leveled areas for house sites) on the highest ridges; the largest site of this type had about a dozen platforms. Surface finds consist mostly of plain sherds and chips of obsidian and are not numerous. Occasional finds of ancient metates, stone axes, and gold ornaments were reported by the Indians who cultivate these sites today. The rest of the sites visited are rubbish deposits of varying depth and extension in the narrow valley bottoms. One, recognized by the modern Indians who call it 'Pijao town,' is the largest rubbish site so far reported from southern Colombia, about two acres in extent with three to four feet of deposit. Pottery is abundant, and perhaps ten per cent of it is decorated: painted in simple linear designs in white and red, incised, or with small figures modeled in relief. The paste of the plain sherds—unevenly fired, with many mica inclusions—prominent polisher marks on the surface, and thickened rims, are traits remarkably suggestive of 'archaic horizon' types from Peru. There was no obvious stratigraphy in the cuts inspected, but differences might well appear with excavation. The pottery described has some resemblances (shape, use of red slip) to Upper Cauca and some to sherds from the neighborhood of Popayán (painted designs), but it is not exactly like any style hitherto reported.

"One tomb discovered accidentally in a house platform, was cleared to prevent its destruction. It consisted of a partially filled shaft about 2½ meters deep at the bottom of which was an unaccompanied burial in bad condition. The body was that of an adult male apparently interred in seated flexed position. No side chamber was found.

"The Guambía rubbish sites are notably richer than the ones so far visited around Popayán itself, and the sherds found are in better condition. Guambía gives every indication of being an important archaeological area."

Robert R. Howard, a graduate student at Yale, is continuing the archaeological survey of Jamaica which he began last summer as a part of that University's Caribbean Anthropological Program. He will be working in collaboration with C. Bernard Lewis of the Institute of Jamaica.

Joint archaeological explorations have recently been undertaken in western Panama by the Bureau of American Ethnology, Smithsonian Institution and the National Geographic Society. Drs. Matthew W. Stirling and Gordon R. Willey, working in Herrera Province from January through March, 1948, excavated four sites and surveyed several others. Of the four excavated sites, two proved to be cemeteries and habitation areas of the Coclé Period. The grave ceramics from these sites compare favorably with those found by Lothrop at Sitio Conte. The Conte site lies about 75 miles northeast of the Parita Zone where Stirling and Willey were digging. A third site, El Hatillo, showed a different pottery style than that commonly recognized as Coclé. Although there are some similarities and overlap between the two, the El Hatillo polychrome style is a new one for Panama. Data and materials have not yet been analyzed but it is possible that the El Hatillo style is slightly earlier than the Coclé. The fourth site excavated was a shell heap near

the sea at Monagrillo. The pottery and stone artifacts found at Monagrillo are quite distinctive. There is no relationship to either Coclé or El Hatillo nor are there similarities to Veraguas, Darien, or any of the other recognized ceramic types of Panama. Monagrillo ware is very simple. Most of it is plain; a small percentage is incised. The incised sherds have vague resemblances to West Indian, early South American, and early Eastern North American potteries. This is mentioned to give an idea of their appearance and degree of technological competence, not to imply relationships. The complete typological isolation of the Monagrillo style in the Panamanian scene and the ecological setting of the site argue for an early relative dating. Although no stratigraphic proof was obtained, it is felt that the Monagrillo style must be the earliest yet brought to light in Panama, a region hitherto known only in terms of late archaeological horizons.

The annual meeting of the Institute of Andean Research for the year 1947 was held at 12:00 noon on December 13 at the Harvard Club, New York City. Dr. S. K. Lothrop, Chairman, presided.

In view of the increasing scope of the activities of the Institute and its members, it was decided formally to extend the field of research, as defined in the charter, to areas in Latin America lying outside the Andes proper but, nevertheless, related from the standpoint of problems in prehistory.

Dr. A. V. Kidder was elected Chairman for the year 1948. A Steering Committee composed of Drs. Strong, Bennett, and Steward was appointed by the Chairman to serve concurrently with him. Dr. Gordon Ekholm will continue as Secretary. Dr. Lila M. O'Neale was elected a member.

Messrs. Lothrop, Kroeber, Bennett, Strong, Steward, A. V. Kidder, Kidder II, Willey, Bird, Tschopik, Gillin, and Ekholm were in attendance. (*G.R.W.*)

EARLY MAN

According to the latest issue of the *American Anthropological Association News Bulletin* (Vol. 2, No. 3, June, 1948), it has been discovered that "Tepexpan Man was not in natural association with the skeletal remains of an extinct elephant. Instead, the burial was of later date and intruded into the Pleistocene deposit." Dr. Paul Sears, Chairman of the Department of Botany at Oberlin College; Helmut de Terra, Pleistocene geologist who made the find; and Loren C. Eiseley, Chairman of the Department of Anthropology, University of Pennsylvania, are credited with reaching this conclusion.

In a preliminary announcement of the discovery of Tepexpan Man, published in AMERICAN ANTIQUITY in 1947 (Vol. 13, No. 1, pp. 40–4), Dr. de Terra stated (p. 41) that "The cut of the excavation showed no traces of intrusive burial nor any signs of subsequent disturbance." Further study has apparently failed to confirm this statement.

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